



RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.

PUBLISHED EVERY FRIDAY BY THE RAILROAD GAZETTE AT 83 FULTON STREET, NEW YORK
BRANCH OFFICES AT 1750 MONADNOCK, CHICAGO, AND QUEEN ANNE'S CHAMBERS, WESTMINSTER, LONDON

EDITORIAL ANNOUNCEMENTS

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages and all of the advertisement pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Transport and Railroad Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.

Vol. XXXVIII. No. 12.

FRIDAY, MARCH 24, 1905.

CONTENTS

EDITORIAL:

Hartford-Bristol Line Operated by Steam	273
Railroad Conditions in Wisconsin	273
Overpay for Undertime	274
Railroad Shop Tools	274
February Accidents	275
Missouri Pacific	275
New Publications	276
Trade Catalogues	276

ILLUSTRATED:

New D. L. & W. Terminal at Hoboken	276
Standard Bridges on the Harriman Lines	278
American Railway Engineering and Maintenance-of-Way Association Reports	280
New Interlocking on the Southern	288
A New Locomotive Drifting Valve	290
High and Low Pressure Retaining Valve	292

MISCELLANEOUS:

Rail Circuits and Zinc-Treated Ties	277
Biennial Report, Wisconsin Railroads	279
Maintaining R. R. Repair Shop Machinery	288
Railway Signal Association	290
Scherzer Bridge Over the Swale River	291
Train Accidents in the U. S. in February	293
General Passenger Agents' Fiftieth Anniversary	294

GENERAL NEWS SECTION:

Notes	85
Meetings and Announcements	87
Personal	87
Elections and Appointments	88
Locomotive Building	88
Car Building	88
Bridge Building	89
Railroad Construction	89
Railroad Corporation News	91

The official statement of President Mellen, of the New York, New Haven & Hartford Railroad Company, that the electric (third rail) service between Hartford and Bristol, Conn., will be discontinued July 1 next, is on its face somewhat puzzling. In the last returns given out (in 1903) by the New Haven Company for traffic on its five electrified steam lines, the Hartford-Bristol road made decidedly the best showing. For three years its returns were:

	Passengers carried.	Receipts.	Operating expenses.
1900.....	1,204,332	\$141,987	\$51,002
1901.....	1,239,725	146,473	43,233
1902.....	1,350,422	159,240	50,988

Total... 3,794,479 \$447,700 \$145,223

It is true that to the operating expense certain additions should be made in this case, such as interest and depreciation on first cost and the cost of maintaining roadway and stations, all these being charged up to the steam line—but even so an operating expense of only about 32 per cent. has seemed to point to a handsome margin of genuine profit. Moreover, when the new line was opened, some eight years ago, between New Britain and Hartford it showed for the first five months a daily average of 2,587 passengers and \$258.70 receipts, as compared with 750 passengers and \$135 per day when operated by steam—a handsome gain, even allowing for novelty traffic. The real reason why electricity is thus discarded from one track of a double-tracked line is not, we feel justified in saying, third-rail dangers or damages or the control of one part of a competing trolley system now that the Hart-

ford street railway has been bought up—but, in the main, because the electrified track is needed for the freight traffic to and from the Poughkeepsie bridge system. That fact in itself is sharply significant. Increased freight traffic compels a prosperous railroad corporation to revert to steam on that one of its electrified roads, which by its own showing has been making a good profit! Does this mean that a similar change is also at hand on its Providence-Fall River system now operated by trolley for passengers and by steam for freight? Does it signify that, given a large freight traffic, steam and electricity cannot be used co-ordinately on double-tracked lines? Must they both use either one power or the other? While the Hartford-Bristol third-rail line is but 18 miles long its passing thus implies some suggestive interrogation marks.

RAILROAD CONDITIONS IN WISCONSIN.

Two years ago there was a lively agitation of railroad questions in Wisconsin, both in regard to taxation and to rates. At that time the Legislature passed a law changing the method of taxing railroads from a license fee system based on earnings to the *ad valorem* method of taxation—a change which has resulted in increasing the taxes of the roads of the state by about half a million dollars, or from a little less than two millions to a little less than 2½ millions. The validity of this law and of the assessments made under it are soon to be

tested in the courts, the railroads having brought suit to have the assessments set aside, while they continue to pay taxes under the former law. In 1903, Governor LaFollette sent urgent messages to the same Legislature that passed the *ad valorem* law, recommending the creation of a railroad commission with jurisdiction over railroad rates, but the measure failed. Last November, Governor LaFollette was elected to a third term after a heated political campaign in which the creation of a state rate-making railroad commission was the chief issue. As a result of this campaign, there has been introduced into the present Legislature, which convened early in January, a bill to create a railroad commission with arbitrary powers over rates and with powers to regulate many railroad operations which have heretofore been left to the discretion of the carriers. The measure is framed very much after the Texas law, and may be summed up as follows:

This measure proposes to give the commission absolute power over freight and passenger rates within the state; to empower but not to require the commission to make freight classifications and tariffs. It empowers the commission to fix different rates for different railroads and for different lines under the same management, or for different parts of the same lines. The commission is to have power to regulate the furnishing of cars to shippers and to establish rates for the storing and handling of freight for the use of empty or loaded cars and for demurrage. It is to regulate the weighing of cars and freight. Any person may enter complaint before the commission or it may institute investigation on its initiative. It can require the railroads to furnish facilities for the construction of warehouses and elevators and to build spur tracks wherever the same may be necessary for the accommodation of shippers. It is to have access to all books and contracts, full powers for investigation and to correct all forms of rebates and abuses. Transportation contracts between carriers must be void without the commission's approval. The commission may decide the quota of each road in a joint rate. The rates in vogue January 1, 1905, must not be increased without the consent of the commission.

The members of the commission are to be appointed for six-year terms and the qualifications required are that one of the commissioners shall have "a general knowledge of railroad accounts and statistics; each of the others shall have a general understanding of matters relating to railroad transportation and the law pertaining thereto."

It is generally conceded that a bill creating a commission will pass, but it is thought that there is a sufficient conservative element in the Legislature to defeat the radical proposition which is before it. This is not the first time in the history of the state that political capital has been created by self-constituted public champions who have bitterly attacked the railroads. It will be recalled that it was Wisconsin which passed the Potter law, in 1874, during the granger period; a law which made it impossible to work the railroads at a profit, kept outside capital away and seriously hurt the development of the state until its repeal, in 1876. But during the granger agitation there was the real difficulty that the industrial conditions—partly brought about by bad railroad management—made it impossible for the farmers and the railroads both to earn a living; at the present time, Governor LaFollette has no such excuse.

Besides the bill referred to, several others have, however, been introduced with the purpose of creating a commission. Most of these have in view the conferring of less radical powers. The joint Railroad Committee of the Legislature has been sitting for several weeks, and all persons interested in

the proposed legislation have been invited to appear before it. This committee seems to be studying the subject closely and does not seem disposed to recommend any other than carefully considered measures. Attorneys of the principal railroads have made extended arguments before it attempting to show that Wisconsin is at least as well off as any of its neighboring states. It is noteworthy that few shippers with complaints have appeared before the committee. Perhaps, the most effective witness against the railroads was E. P. Bacon, whose testimony does not seem to have been controverted that rates on grain and livestock were between 15 and 25 per cent. higher for the same distances in Wisconsin than in Illinois.

OVERPAY FOR UNDERTIME.

A level headed superintendent observed recently, in a conversation about economy of freight train movement, that on some roads the officers had striven so blindly for extreme high records in train loads—for extremely favorable results from "tonnage rating"—that they had gone mad on the subject. Finding that for years they have neglected to load locomotives to their capacity, they now, in their new-found enthusiasm, pile on the full loads with such unvarying regularity that they defeat their own purpose by causing losses of time that more than offset the gains in tons. This is easily believable. Delays to freight trains entail a great variety of losses—those that can be measured and those that cannot—which are too familiar to need rehearsal. But when it comes to curing these delays, the superintendent, the trainmaster and the dispatcher find themselves with a complicated task on their hands. One day it is poor coal; another it is an engine that does not steam, from some cause which is obscure or unknown; and another it is a broken draw-bar which "lays out" three or four trains. These and other troubles arising in the "materiel," are made worse by various degrees of incompetence in the personnel. Pride in certain good records already made keeps the trainmaster from relieving the strain on engines and men by reducing the loads, and so the trouble continues. What ought to be done?

There seems to be considerable merit, theoretically, in the proposition to enlist the co-operation of the trainmen, by paying them a premium for making good time; what is to hinder any one from proving the theory meritorious practically? The conductor and engineman are the first to discover each difficulty, and they are "on the ground"—are where they can deal with it at short range. If they are competent men, and can have the means of quick communication with headquarters, so as to avoid conflict with other conductors and engine-men, they can overcome many hindrances. The question of communication is now easy, for telephones can be installed cheaply everywhere, and the question of competency depends largely on practice. The conductor who has the necessary authority (he has most of it already) to take short cuts to save minutes will soon learn to exercise it; and proper supervision will enable him to avoid mistakes. The premium is necessary to arouse those who are less inventive and

resourceful; and even if all your conductors combine quick wit and extreme caution, both of which our rules seem to demand of every employee, the premium greatly helps the trainmaster or inspector who has to regulate their work. There is a great advantage in having brains at both ends of the line; in the development of the railroad from a one-man affair to a great machine we have been constantly tending toward machine-work exclusively—toward the kind of work wherein all of the brains are in the captain and none in the rank and file. It is quite likely that we have carried that idea too far. It is not so easy to develop smart conductors as it was in the good old days when each had on occasion to be his own superintendent; but on the other hand, it is not nearly so hard as it seems.

A conductor, three brakemen, engineman and fireman if on the road 13 hours receive say \$1.50 to \$2 for working one hour overtime. Why not pay them an equal sum in case they are able to reach the end of their run in one hour less time than the pay-schedule provides for? The saving of one hour in the work of the locomotive and in the service of the cars would more than compensate for the money paid out. Is not two dollars a small sum to pay for advancing a 60-car train 60 minutes? This is the simplest and crudest way to look at the matter; for in point of fact there are other losses entailed by the 13-hour run, in addition to the money paid in wages; and, on the other hand, there are other gains, besides those just mentioned, when an hour is saved. When traffic is heavy the saving by increasing speed is patent to all; but on a single-track line there is usually a similar, though perhaps less marked, saving when traffic is only normal.

Premium paying is not an automatic scheme which would need no attention. As in changing from day work to piece work in a shop, the abolition of one set of difficulties would be in part neutralized by the introduction of another set, but the change is justified, nevertheless, if the balance is on the right side. In the old days it was considered (in the rule books) a sin to run faster than 15 miles an hour. In so far as high speed is dangerous, that old idea must still be kept in view; but it will scarcely be claimed that the danger of excessive speed need be a serious obstacle to the plan here suggested. As in the piece work system in shops, care must be taken to see that the men do not hurry or slight their work. This, however, would not be a new kind of task for the trainmaster or inspector; but having more of this work to do would introduce into his activities a refreshing change which might improve him as well as his subordinates.

Everyone knows that where schedules are figured at 9, 10 or 11 hours, with the 12-hour limit, men do a good deal of soldiering. But whether they do much or little, it is clear that they are frequently under a strong temptation to thus waste time. Requiring a train to be an hour and a half late to secure extra pay might be called a school to encourage laziness and dishonesty. On the other hand, payment of the premiums for undertime would encourage honest men and would help to cultivate an honest spirit in those who have been cultivating the opposite. Many men who are more or less dis-

honest in their dealings with their employer would prefer to be honest if they could be so as well as not.

A conductor and an engineman who set out to earn a premium for making good time must first cure their own deficiencies. The first effect of a premium-offer should be to make them more alert to seize opportunities to save time and more cautious and far-sighted. They should think more about the details of their work and more frequently consult each other. But, as already intimated, they should, besides this, do some things which now they do not have authority to do. Instances occur every day where it would be a decided advantage to the company for a conductor to set out a half-dozen cars for the sake of making better time; but under the ordinary regulations it is not deemed wise to clothe him with discretion to do this. Under a properly adjusted premium system, in which making time at the expense of tonnage would be censurable if carried out too enthusiastically, he could be trusted to exercise his judgment. Such a course would be an experiment, it is true; but an experiment well worth trying.

And, frankly, the whole scheme of undertime premiums is experimental; but so serious and so difficult a problem justifies experiments. As long as the elements which help or hinder a freight train in getting over a division are so diverse that it is impossible to classify or define them for any given trip beforehand, there is room for the exercise of judgment by the men in charge; and the cultivation of these men's judgment is therefore a plain duty. Conductors and engine-men are, in fact, the men who run the railroad. The superintendent is only a regulator and the shops are only aids.

Railroad Shop Tools.

If I were at the head of the Mechanical Department of a railroad and should be required to choose between an old shop fully equipped with strictly up-to-date machine tools and a new shop provided with traveling cranes and other similar modern appliances, but in which a lot of old tools were to be retained, I would unhesitatingly prefer the former as being the most efficient means of maintaining the rolling stock and the best investment of the railroad company's money.

The above is quoted from the excellent paper of M. K. Barnum on maintaining railroad repair shop machinery, which is printed elsewhere in this issue. The paper contains many suggestions for economy in the operation and maintenance of railroad shops. The author is a strong advocate of a machinery depreciation fund. He suggests that every railroad company should start such a fund for maintaining the efficiency of its shop tools. Five per cent. is taken as a fair amount to be allowed for depreciation on each tool per year, and it is claimed that an annual appropriation of 5 per cent. of the value of the machinery in each shop would practically renew the machine equipment once in every 20 years. In buying new machines care should be taken to select those which will effect the largest earnings. Care should also be taken to see that the machines which are least profitable are the first to be replaced by new machines. Special machines, excepting wheel and axle lathes, which are, as a rule, essential, are unprofitable except in cases where they can be kept in constant use. In selecting lathes, for example, it would in many cases be better to select a turret lathe than an engine lathe, for on certain classes of work a modern turret-

lathe will produce from two to five times as much work as an ordinary engine lathe. Another machine which is preferable in many cases to an engine lathe is the vertical boring and turning mill. This machine will produce at least double the amount of work that is possible on an engine lathe, and has the added advantage of occupying less floor space. A well-equipped tool-room has more to do with the efficiency of a shop than the majority of master mechanics seem to realize. Every tool should have its place and should be kept in good condition so that when it is needed it can be procured quickly and be found in condition for immediate use. Old machine tools should be replaced by modern tools as quickly as possible, for until they are the railroad shops will not be able to reap the benefits to be derived from the use of the modern high-speed tool-steels.

February Accidents.

The condensed record of the principal train accidents which occurred in the United States in the month of February, printed in another column, contains accounts of 30 collisions, 17 derailments, and one boiler explosion. Those which were most serious, or which are of special interest by reason of their causes or attending circumstances, occurred as follows:

	Killed.	Injured.
3d. Belmore, Ohio,	1	11
4th. Whitesboro, N. Y.	2	33
9th. Melbourne, Ia.	1	30
14th. Holland, Mich.	0	5
14th. Gypsum City, Kan.	0	12
16th. Port Henry, N. Y.	0	0
20th. Wota, Iowa.	2	12

Belmore, Whitesboro, Melbourne and Wota are about equally entitled to the honor of standing at the head of the list this month; but all four together caused fewer deaths than were caused by a single accident in December; and December in this respect was like every other month in the last half of 1904; July, August, September, October and November each had an accident killing more than six. The cause of the Whitesboro accident was discussed in the *Railroad Gazette* of February 17. Concerning the other three we have no information beyond that given in the report. Holland and Gypsum City, which occurred on the same day, illustrate the difficulties of flagging in snow storms or when the snow on the ground is deep. The accounts of these collisions do not locate the fault precisely; but if it was in depending on the time interval and flagging when the time interval was clearly of no value and when the theory of flagging was at its greatest disadvantage, these were not unlike many previous cold-weather collisions.

The worst railroad accident in February, that at Arkport, N. Y., on the 1st, was not a train accident; it was the wrecking of a sleigh and the killing of ten women at a highway crossing. This was reported in the *Railroad Gazette* of the 10th.

The number of electric car accidents reported in February was six; killed 1, injured 81.

Missouri Pacific.

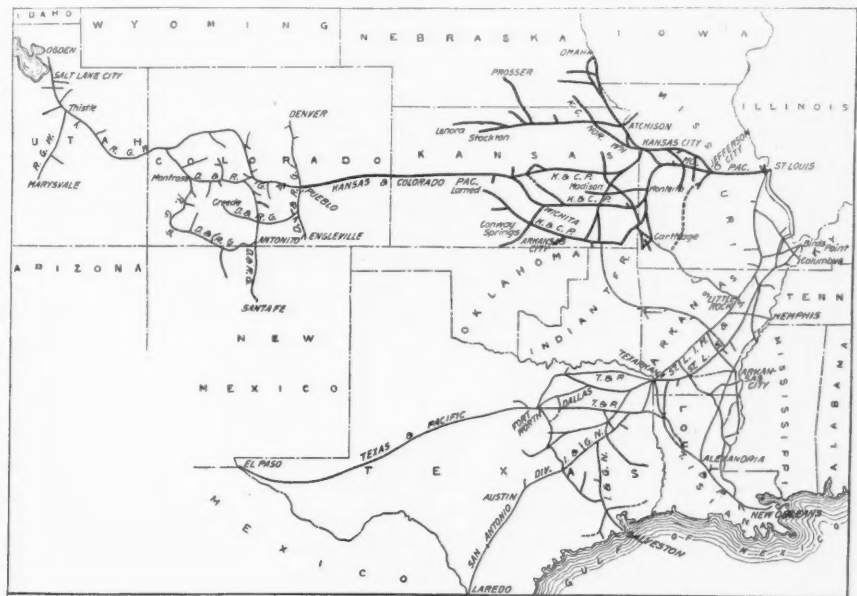
The report for the year ending Dec. 31, 1904, shows gross earnings of \$43,693,617, as compared with \$43,095,769 last year. Operating expenses were \$30,406,041 as against \$29,415,004, and net earnings were \$13,287,576 as against \$13,680,765. The net increase in the mileage of the system during the year was 126 miles; the Missouri Pacific lines showing a slight decrease owing to the abandonment of certain trackage rights, and the St. Louis, Iron Mountain & Southern lines showing an increase of 141 miles.

The income account in Missouri Pacific re-

ports does not list operating expenses in the customary manner, and is therefore not susceptible to comparison with other roads. The items given are, conducting transportation, motive power, maintenance of way, maintenance of cars, and general expenses. But the heading "motive power" includes much that is ordinarily put in conducting transportation, as, for example, the cost of fuel, and the wages of engineers and firemen. It is possible to rearrange this account somewhat, with the aid of a separate table showing the cost of repairs and rebuilding locomotives, which corresponds quite closely to the locomotive charge, ordinarily reported under maintenance of equipment. The total number of engines in service on the system in 1904 was 923; and the charge for rebuilding and for general, heavy, light and running repairs was \$1,877,230, or \$1,965 per locomotive. This is evidently a liberal sum for locomotive up-keep, and probably no great error will be made in subtracting it from the charge to motive power and carrying the balance over to the head of conduct-

these points. Grade reductions north and south of Little Rock, Ark., have cost to date \$1,092,276, producing a maximum gradient the same as between Little Rock and Van Buren, and they have made possible an average increase in loading to 516 tons (70 per cent.) between Texarkana and Little Rock, and of 523 tons (45 per cent.) between Little Rock and Hoxie. Between LeRoy and Coffeyville the grade has been reduced to a maximum of .75 per cent. compensated, and unnecessary curves have been eliminated at a cost, to date, of \$532,368 with an increase of 350 tons per train gained.

Freight earnings were \$29,953,088 this year as against \$31,271,688 last year. There was a short crop of corn and oats in the territory reached by the system, the tonnage of corn falling off over 25 per cent. and of oats over 36 per cent., with the result that the available corn was used for local consumption with movement limited to short haul. Moreover, the wheat crop being of a somewhat inferior quality, but with high domestic prices due to shortage, did not give the export tonnage which prevailed last



Missouri Pacific System.

ing transportation, which with this increase comes to \$19,981,654.

The charge for maintenance of way and structures was \$5,287,756, which figures out at \$861 per mile on the 6,140 miles worked, as against \$958 per mile on 5,846 miles worked in 1903. During the year 113 miles of new 85-lb. rail were laid and two miles of new 75-lb. rail. This brings the total of 85-lb. rail on the system up to 614 miles. There are 1,667 miles of 75-lb. rail, 653 miles of 63-lb. rail, 381 miles of 60-lb. rail, 2,270 miles of 56-lb. rail, and 481 miles of 52-lb. rail. This shows that there is much track work to be done on the lines, and it is interesting to note that there still remains 129 miles of iron rails on the system, chiefly on the Central Branch. The work of grade adjustment which has been carried on vigorously for several years past was reported as practically completed during 1903; but \$374,776 was spent last year in bringing up to the required standard the lines affected. On the Little Rock & Fort Smith Railway between Little Rock and Van Buren \$3,296,999 has been spent to date in reducing grades from a maximum of 1.75 per cent. to an average and maximum of .6 per cent. compensated, and has enabled a tonnage rating 550 tons per train greater to be established between

year. There was an encouraging increase during the year in manufactures and merchandise on all three of the roads forming the component parts of the system. There was also a good increase of coal, chiefly due to new manufacturing requirements on the Missouri Pacific and the St. Louis, Iron Mountain & Southern, since the Central Branch reported a slight decrease. In spite of the general decrease in tonnage, however, it was apparently necessary to run an increased number of trains to handle it. The freight train mileage in 1904 was 148,196 for the entire system, as compared with 138,973 last year, and this increase was shared by all three of the roads comprising the system. The average revenue train load decreased from 302 tons to 271 tons. The considerable decrease in long haul grain has, of course, affected this result materially.

The results from passenger traffic are, however, very gratifying. Passenger earnings increased from \$7,126,378 in 1903 to \$8,995,345 in 1904, an increase of \$1,868,967, which more than offsets the decrease of \$1,318,600 in freight earnings. A considerable proportion of this gain is, of course, due to the St. Louis Fair, but with an increase in passenger train mileage of 1,730,604 miles only 1,081,627 represents additional service

between May 1st and December 1st for accommodation of World's Fair business; the rest indicates what might be called permanent new traffic due to the development of the country. A total of nearly 463,000,000 passengers were carried one mile as against approximately 319,000,000 last year. A total of 209,963 round-trip tickets to the Fair were sold, bringing in a total revenue of \$1,577,058. Subtracting this from the figure for passenger earnings previously given still leaves an increase of almost \$292,000 over last year, in spite of the fact that World's Fair excursions took the place of much of the ordinary summer excursion business, which is therefore not included in the returns.

The total expenses for the year were \$30,406,041, which is at the rate of \$4,952 per mile as compared with a total of \$29,415,004 in 1903, at the rate of \$5,032 per mile. Gross earnings figure out at \$7,116 per mile as against \$7,372 per mile, and net earnings aggregating \$13,287,576, or \$2,164 per mile, compare with \$13,680,765, or \$2,340 per mile in 1903.

Since Jan. 1, 1905, a loan of \$25,000,000, bearing interest at 4 per cent., running 40 years, secured by Iron Mountain stock at par, has been negotiated by the Missouri Pacific Railway. It is provided that the loan may be increased to \$50,000,000, if circumstances require. This provides the funds necessary to relieve the company from all unfunded obligations, and in addition affords capital for improving the property and enlarging the facilities to meet the requirements of increasing traffic. The company now is entirely free from all floating debt.

The principal statistics of the year's operation follow:

	1904.	1903.
Average mileage worked	6,140	5,846
Freight earnings	\$29,953,088	\$31,271,688
Passenger earnings	8,095,345	7,126,378
Gross earnings	43,693,617	43,095,769
Conducting transportation	11,906,387	11,237,604
Repairs & renewals, locos.	1,877,230	2,031,011
Other charge to " motive power"	8,085,267	7,253,015
Maint. of cars	2,241,634	2,304,179
" way & structures	5,287,756	5,603,056
Total expenses	\$30,406,041	\$29,415,004
Net earnings	13,287,576	13,680,765
Taxes	1,298,771	1,225,239
Surplus from oper.	11,988,805	12,455,525

NEW PUBLICATIONS.

Boiler Room Chart. By Geo. L. Fowler. The Norman W. Henley Publishing Company, New York. Size 14 in. x 26 in. Price, 25 cents.

This is an educational chart, showing in isometric perspective, the mechanisms belonging in a modern boiler room. The equipment consists of water tube boilers, ordinary grates and mechanical stokers, feed water heaters and pumps. The various parts of the appliances are shown broken or removed so that the internal construction is fully illustrated. Each part has a reference number and these with the corresponding name are given in a glossary printed at the sides. The chart, therefore, serves as a dictionary of the boiler room, the names of more than two hundred parts being given on the list.

How to Mix Paints. By C. Godfrey. Size 5 in. x 7½ in. Illustrated. Cloth binding. Industrial Publishing Co., New York. Price 50 cents.

This book is intended for those who have not had the benefit of a long training and experience in mixing colors. Simple and clear directions are given so that by a little practice the reader may be able to mix the various tints and shades of reds, blues, yellows, browns, greens, grays and colors made from blacks, japans, etc. Besides the directions

for mixing paints, notes are given about tints and shades, the use and care of brushes, hints on displaying colors to show customers, color harmony, etc. This book will be found an exceedingly handy reference for both amateur and practical painters.

TRADE CATALOGUES.

New Alloys.—Bulletin 11 of The Buda Foundry & Manufacturing Co., Chicago, is devoted to Buda metals. It announces that through the discovery of new alloys and new processes the company is producing a line of metals showing great economical advantages due to superior strength and wearing qualities. There are seven of these metals, viz., Buda Fibro, Buda Aluled, Buda Locomotive Bronze, Buda B Bronze, Buda C Bronze, Buda Zeno, Buda Cupro Steel. The circular gives the composition, uses and advantages of each, and suggests tests for each. It states that tests thus far made show from 25 to 75 per cent. in advantages gained.

Railroad Water Service.—Wm. M. Jewell, Chemical Engineer, has prepared a booklet on water service for railroads, in which he deals with the subject from the standpoint of the expert in water purification. He treats the subject under the following heads: Introduction, Water Sources, "Hard" Waters, Incrusting Constituents, Softening Waters, Clarifying Turbid Waters, Pure Water Equipments, Economy of Water Purification, Collection of Samples. There is also a reprint of an article by the author on "Water for Locomotive Boilers," printed in the *Railroad Gazette*, Nov. 15, 1903. Mr. Jewell's address is Cable Building, Chicago.

Standpipes and Water Tanks.—Bulletin No. 2 of the Otto Gas Engine Works, Chicago, tells how to handle water to the locomotive, with improved fixtures. Illustrations are given of Otto flexible-joint standpipes and engravings from line-drawings show details and how the standpipe should be connected up. Another engraving shows how to connect Otto tank fixtures. Half-tone views and price lists of these fixtures are given, also tables of cast-iron pipe and fittings. A drawing is shown of a new design of steel bottom tank, with the space beneath enclosed by a concrete wall.

Paint.—The Detroit Graphite Manufacturing Company, Detroit, Mich., has issued a little folder advertising its "D. G. M." signal paints, which are well-known to signal engineers who have iron structures to paint. This paint is recommended not only to withstand heat, cold, moisture and sulphurous fumes, but is declared to be excellent on either wood or metal when placed underground. The folder has pasted to it small strips showing sample colors, of which lemon yellow is at the top, indicating (perhaps) the final triumph of this over all other colors for use on semaphore arms.

Car Truck.—The J. G. Brill Company, Philadelphia, Pa., sends a handsomely illustrated pamphlet descriptive of the Brill No. 27 E truck. A full detailed description of this truck, which is intended for heavy electric and steam service, is given, as well as detail drawings showing the different parts of the truck, such as the solid forged side frames, the equalizing spring links, the adjustable bearings, etc. The pamphlet closes with a number of highly commendable testimonial letters from a number of prominent roads.

Hydraulic Jacks and Boiler Makers' Tools.—A. L. Henderson's Sons, Wilmington, Del., send a catalogue which is of interest to boiler

makers, as it describes and illustrates a number of specialties such as roller tube expanders, steel screw punches, rail and structural iron punches and hydraulic head punches, as well as a number of different designs of hydraulic jacks. Tables showing the sizes and prices for all of the above tools are given.

Steam Shovel News.—The second number of this new magazine opens with an article on "Progress in Irrigation," followed by other briefer ones on "The Workman Who Cheats," the "Soo Semi-Centennial" and "Ancient and Modern Steam Shovel Construction." There are also descriptions of some new classes of Vulcan shovels, and miscellaneous matter and notes. A binder for the magazine is being sent to new subscribers, the subscription price being 50 cents a year.

Cattle Guards.—The Climax Stock Guard Co., Chicago, issues a folder relative to its "Clay" cattle guards. The advantages of this sort of guard are stated and views given of installations on prominent roads. A leaflet accompanying the folder shows a view of the exhibit this company had at the World's Fair, and describes and gives other information about the guard.

Roller Bearings.—The Hyatt Rolier Bearing Co. sends an interesting pamphlet containing the results of tests of different types of roller bearings. The pamphlet contains 8 tables giving the co-efficients of friction and starting torque, as well as seven plates which show the horse-power and foot-pounds required to overcome friction at various speeds and loads.

Machinery for Cement Making is the title of a pamphlet which is being distributed by the Allis-Chalmers Company, Milwaukee, Wis. In it is described machinery for every stage in cement making by either the wet or dry process, including rock breakers, crushers, dryers, kilns, ball mills, tube mills, elevators and conveyors.

Dump Cars.—The Continental Car & Equipment Co., New York and St. Louis, Mo., is distributing its 1905 catalogue in which a brief description and illustrations of different designs of dumping cars are given. This company carries a complete line of dumping cars, including the rotary, the one-way, the two-way, the end dump and the gravity car.

Graphite.—The Joseph Dixon Crucible Company, Jersey City, N. J., is distributing its April issue of "Graphite." It contains a number of illustrations of notable bridges and buildings, in different parts of the world. It also includes a number of short practical articles of interest to railroad men on good paint and good painting.

The Little Blue Flag.—"Factors That Affect Results in Painting" is the leading article in the March number of the magazine of The Lowe Brothers Company, Dayton, Ohio. The remainder is filled with the usual interesting matter for salesmen of, dealers in, and users of paint, particularly "High Standard."

New D., L. & W. Terminal at Hoboken.

The Delaware, Lackawanna & Western has let contracts for its new railroad and ferry terminal at Hoboken, N. J., and it is expected that the work will be completed within two years after the foundations are commenced. The building will be erected in six sections, as no interruption to train or boat service will be allowed. The plans call for an absolutely fireproof structure resting

on concrete foundations supported on piles. The walls will be of reinforced concrete and the entire interior will be covered with heavy copper, treated with acid so as to produce different shades of green and brown. In the accompanying illustration the ferry house, with its six slips, is shown to the right, while the railroad waiting-room and tracks are on the left.

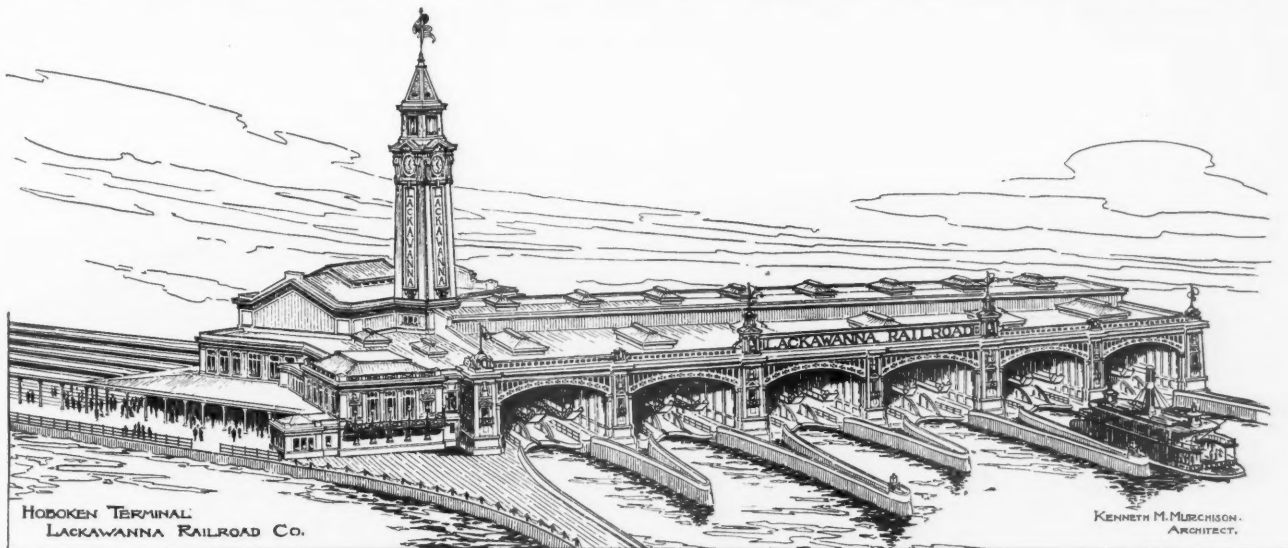
A tower 200 ft. high will form a prominent part of the building. A clock 12 ft. in diameter will be mounted in this tower. The main waiting room will be 100 ft. square by 50 ft. high. It will have a limestone base

the offices of the ferry company. Aside from its enormous passenger traffic, which passes through the ferry house, great care and attention had also to be given to the handling of the large volume of trucking business which passes over the ferry each day. Immediately to the south of the structure is located the immigrant station and the Pullman supply depot. This building is well under way and will be finished in a few months. The old D., L. & W. terminal had but nine tracks whereas 16 will enter in the new terminal. The type of train-shed has not been finally decided upon, but inverted

umbrella sheds will probably be used. The architect of the new structure is Kenneth M. Murchison, New York, and the work will be performed under the supervision of Lincoln Bush, Chief Engineer.

Rail Circuits and Zinc-Treated Ties.

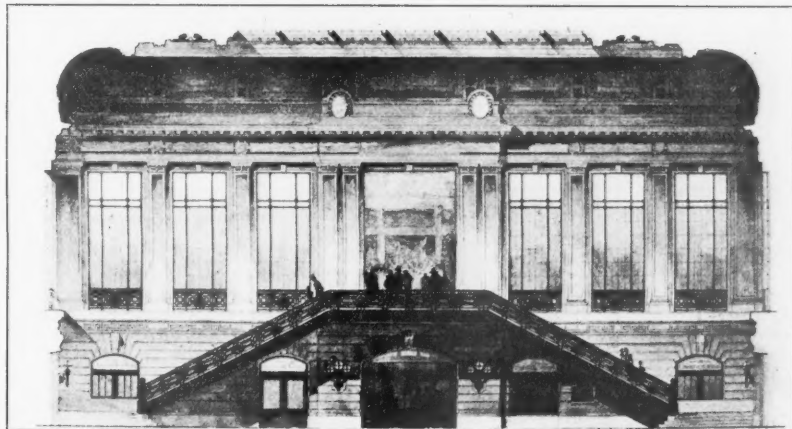
The Illinois Central last year laid in its tracks where automatic signals are used a large number of sleepers which have been treated with the zinc-chloride preservative process; and the rail circuits at once began



New Delaware, Lackawanna & Western Terminal at Hoboken.

which will extend to the second floor level; above the second floor the decorations will consist of plaster work, ornamental iron and bronze. A concourse 70 ft. wide will give access to the second decks of the boats, and will be reached from the grade of the tracks by either an inclined walk or by wide stairways and elevators. Passengers going from the boats to the trains will not have to pass through the main waiting room, as a concourse 40 ft. wide, terminating in a flight of stairs leading directly to the train concourse, will be provided. On the second floor and away from the noise and gases of the locomotives is located the restaurant. Two sides of this room will be studded with large windows which will overlook the river, and a balcony over the water can be used for dining out of doors in the summer.

The division offices of the company will be moved to the new terminal building, and provision has also been made there for all



East Elevation Interior of Main Waiting Room—D., L. & W. Terminal.



West Elevation Interior of Main Waiting Room—D., L. & W. Terminal.

to give trouble. The sleepers were sufficiently good conductors to make frequent connections between the opposite rails, and the rail circuits had to be shortened at once. Fortunately, however, the electric current, inherently upright and disposed to follow the path of rectitude, at once attacked the evil spirit in the ties, which sought to lead it astray, and, we are informed by Mr. Dunham, soon had it subdued to such an extent that the ties again became good insulators. Further details of this interesting phenomenon are given in the following report of Signal Inspector V. I. Smart:

"Since the introduction of treated ties in the track of the steam railroad it has been found that ties treated by the 'zinc-chloride' process have developed trouble in the track circuits of the automatic signals. In some cases they have proved such an obstruction to the proper working of the track relays that it has been necessary to shorten the

length of these track sections. A peculiarity of the trouble is, however, that it disappears after the circuits have been in operation for a time and it is then possible to again extend the sections to their original length.

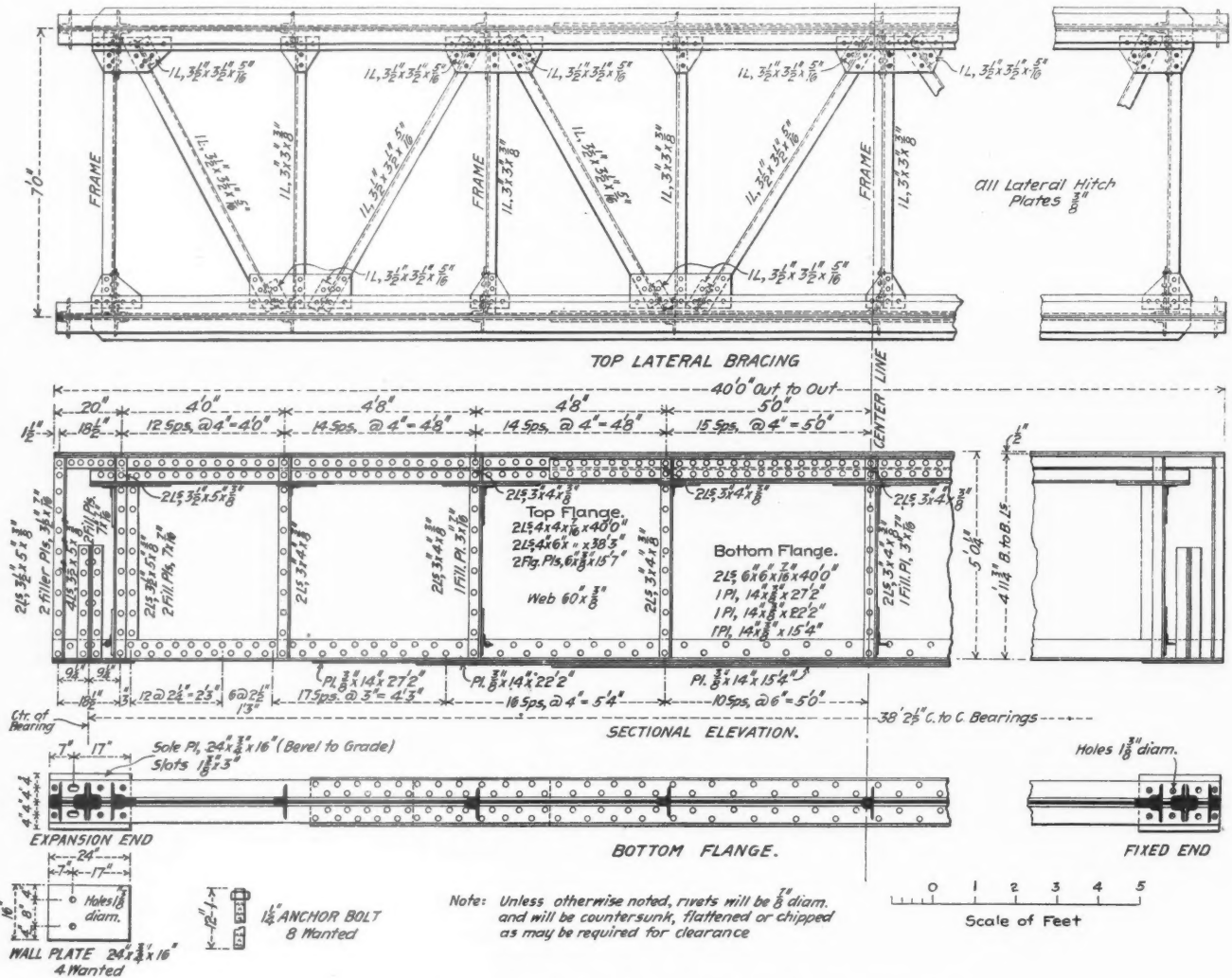
"The trouble is due to the enormously increased conductivity of the tie, due to the chloride of zinc solution. A tie thus treated has a resistance of approximately 8,232 ohms, and as the resistance between the rails varies inversely as the number of conduc-

is one of the iron spikes holding the rail to the tie. Zn is deposited at the other spike, the negative pole. The Cl enters into combination with the H in HO, forming HCl, or hydrochloric acid, and this attacks the iron of the spike, producing FeCl, or chloride of iron, which is deposited on the spike, or rather between the spike and the wood of the tie, in greenish-blue, hydrated crystals. This deposit of chloride of iron offers sufficient resistance to the weak track circuit to reduce the conductivity of the tie to such

crystals of FeCl on the spike are necessary to successful working."

Standard Bridges on the Harriman Lines.

Last week we showed the plans for the 20-ft. I-beam girder bridge and 30-ft. plate girder bridge adopted as standard on the Harriman Lines together with the complete specifications covering all steel bridge work. The drawings in this issue are of the 40-



Details of Standard 40-ft. Deck Plate Girder Railroad Bridge, Harriman Lines.

tors between them, it is quite apparent that we can introduce enough ties in a section to reduce the resistance between the rails to such an extent that the current will leak across, and therefore fail to hold the relay. In a section 5,000 ft. in length there will be 4,166 of these ties, which would reduce the resistance between the rails to about 2 ohms, and with an initial potential of 1.2 volts on the track, there would be a loss of about .6 of an amp. in this length of track circuit, due exclusively to the treated ties, which together with other losses may easily cause trouble with the relays.

"By reducing the length of the sections we increase the resistance between the rails; but, as before stated, after the track sections have been working for some time the trouble disappears. The ties have lost part, at least, of their conductivity. This loss is due to the effect of the electric current passing through the tie, causing an electrolysis of the zinc solution (ZnCl, HO). The Cl is freed at the positive pole, which in this case

an extent that the track circuit section may be lengthened considerably without the trouble with the relay reappearing.

"It therefore appears as if it would be good practice when a track circuit is to be installed and a large number of these ties are in the track, that several cells of battery in series be put on the track for some considerable time before the signals are to be put into service, thus increasing the resistance between the rails, and permitting the use of track circuits of the ordinary length without danger of trouble. Care must be taken that the polarity of the rails is always maintained the same.

"On account of the great affinity of chlorine for water, ties treated in this manner will never become thoroughly dry. The trouble would therefore return if the spikes on the positive rail were renewed, as the

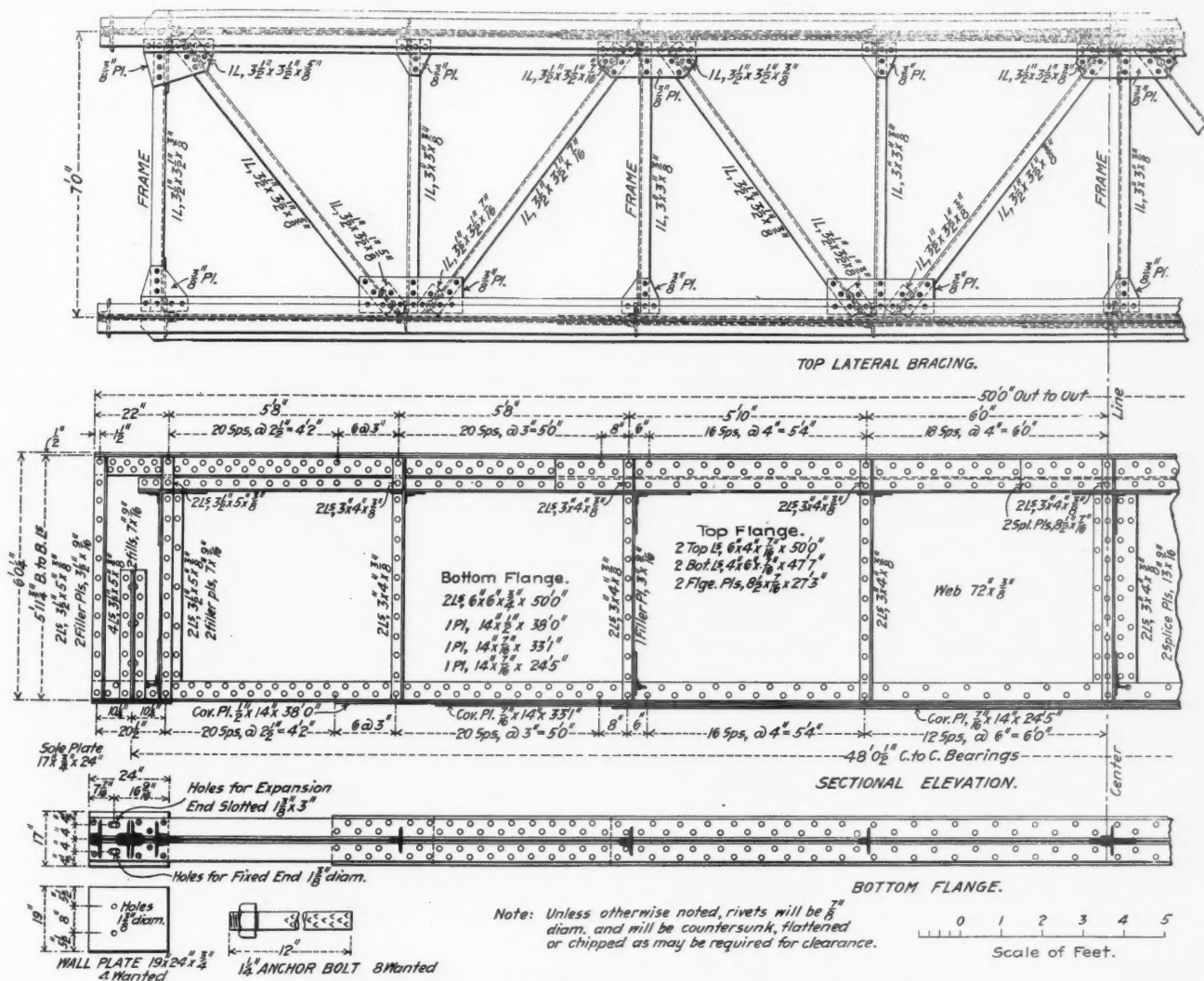
ft. and 50-ft. plate girder spans. Some important differences will be noted in the distribution of metal in the flanges in the 30-ft. girder shown last week and the 40-ft. girder shown here. The depth of the 40-ft. girder has been increased $11\frac{1}{2}$ in. to 4 ft. $11\frac{3}{4}$ in., and an additional bottom cover plate 15 ft. 4 in. long has been put on. Instead of a third top cover plate for increas-

ing the metal in the top flange, a 3-in. x 4-in. x $\frac{3}{8}$ -in. angle has been added inside and out, just below the top flange angle, and an 8-in. x $\frac{3}{8}$ -in. plate is riveted over the vertical legs of both angles. The top lateral bracing has been increased to include connections at each panel point and more vertical stiffening has been put in at the ends of the girders

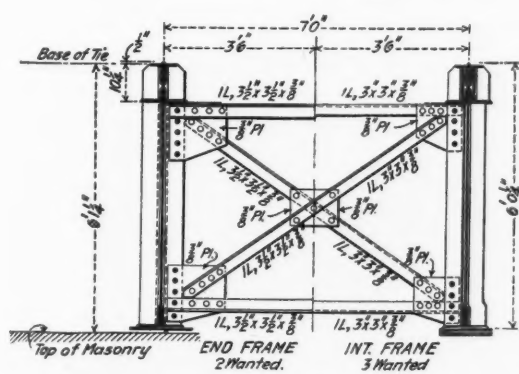
Biennial Report, Wisconsin Railroads.

A limited number of copies bound in paper of the eleventh biennial report of the Railroad Commissioner of Wisconsin has been issued for the use of the Legislature now in session at Madison. The report is to be issued shortly bound in cloth. In the matter

spurs and branches from the larger roads, are constructed into the timber and taken up and abandoned when the timber is exhausted. As the timber is being rapidly exhausted more of these lumber roads are now being removed than are built, so that the gross railroad mileage in the state is not increasing very rapidly.



Details of Standard 50-ft. Plate Girder Railroad Bridge, Harriman Lines.



over the bearing plates. The estimated weight of one 40-ft. span is 23,800 lbs. The 50-ft. girder is 5 ft. 11 $\frac{1}{4}$ in. deep from out to out of flange angles, and is practically identical with the 40-ft. girder in the details. It weighs 34,300 lbs.

of form the report is a great improvement over former reports. It consists of 436 pages of matter clearly printed on good paper, and contains 16 full page photos of interlocking plants, engines, new stations, arches and bridges of various roads in the state. The mileage of line in the state is as follows:

June 30, 1901.....	6,762
June 30, 1902.....	*6,916
June 30, 1903.....	6,862
June 30, 1904.....	6,923

*Miles operated.

The northern part of Wisconsin is a lumbering district, and small railroad lines, and

The report points out that accidents resulting in personal injury within the state have increased greatly. There were 607 injuries to persons reported for the year ending June 30, 1900, of whom 228 were killed and 379 injured. For the year ending June 30, 1903, there were 1,156 injuries to persons, of whom 179 were killed and 977 injured. For the year ending June 30, 1904, there were 1,468 injuries to persons, of whom 190 were killed and 1,278 injured. Of the killed in 1904, seven were passengers, 63 employees, 97 trespassers and 23 "others." Of the injured, 213 were passengers, 966 employees, 67 trespassers and 38 "others."

The operating account of Wisconsin roads within the state since 1900 has been as follows:

Year ending Dec. 31:	1900.	1901.	1902.	1903.	1904.*
Gross earnings	\$40,759,951	\$43,577,576	\$47,718,565	\$40,513,379	\$45,566,697
Operating expenses	26,824,409	27,786,298	31,463,897	31,405,275†
Net earnings	13,935,542	15,791,278	16,254,668	18,108,104†
Gross earnings per mile	6.208	6.444	6.900	7.099	6.684*
Net earnings per mile	2.123	2.335	2.350	2.594†

*Year ending June 30th, 1904.
†Not reported.

Ton miles were 2,632,983,391 in 1903, and 2,470,980,683 in 1904. Average haul was 78.95 and 96.98 miles, respectively. Freight earnings per train mile were \$2.32 in 1903 and \$2.19 in 1904. The number of employees within the state for the year ending June 30, 1903, was 28,339, and 25,504 in 1904, though the figures are admittedly inexact.

There are recommendations for legislation from the commissioner to regulate the height of bridges and other obstructions above the track, to require reports from private car lines doing business in the state, to provide against railroad officials and employees becoming interested in elevator companies which do business over the line of road with which they are connected, and to require railroad companies to file list of names of all persons living in Wisconsin securing free transportation. The physical condition of the railroads in the state is discussed at some length in a report by W. D. Taylor, Professor of Railroad Engineering in the University of Wisconsin. Professor Taylor criticizes the ballasting of the roadbeds on the ground that the ballast in prevalent use is of poor quality and very dusty. He points out that it is desirable that the large number of temporary inflammable wooden bridges, amounting on some of the railroads to one bridge of this character every two-thirds of a mile, should be replaced by permanent and safe structures, and that the public should condemn the practice of any railroad which operates its trains over bridges that are not known to be abundantly safe to carry the loads brought upon them by modern heavy cars and engines. Complaint is also made about the unsanitary state of many of the cars and smaller stations, and as a matter of public safety it is urged that the common practice of placing light, flimsy coaches in fast trains between heavy parlor and sleeping cars and the locomotive should everywhere be discontinued.

The engineer reports that the most fruitful source of danger lies not so much in physical defects of the roadway, such as poorly built lines, weak bridges, etc., as in connection with the operation of trains. Less than 79 miles of road in the state are operated under any form of automatic block signals. It is complained, also, that when there is a slight falling off in traffic and orders are issued to promote economy, there is a tendency to remove operators from certain stations, thus making the telegraph offices farther apart. It is pointed out that a regular and continuous expert inspection of the physical condition of each road is highly important. No inspection of this kind at present exists in Wisconsin, and the only examples of it in the last quarter of a century, so far as can be determined by the published accounts, are a series of reports on the condition of the Green Bay & Western road in the early '80s, and a report on the condition of some of the bridges of four of the larger roads in 1900. The present law limits the commissioner to an expert for the examination of bridges, and the total expenditure allowed is only \$800 a year. Comment is made on the unfortunate fact that the time of most of the other western railroad commissions as well as that of Wisconsin is so taken up by the clamors of the public in regard to rates, station facilities, for having fast trains stopped at small stations, etc., that there is but little time left for the consideration of public safety. An inspection of the roads just completed shows that considerable attention has recently been paid to betterment work. All of the large lines are now relaying portions of their track with new and heavier rail and nearly all of them have spent large sums in the last few years in grade reduction, re-location, in

building better bridges and in purchasing or building better and stronger equipment.

American Railway Engineering and Maintenance of Way Association Reports.

The committee reports presented to the Maintenance of Way Association cover a wide range of subjects and contain a large part of each report (except the one on signaling, which will be printed in detail, later) is contained in the following abstracts.

UNIFORM RULES AND ORGANIZATION.

The committee on uniform rules and organization concluded that it would be inadvisable to formulate rules for a uniform organization above certain positions and so the accompanying outline of organization stops with the office of supervisor, leaving the roads to formulate the departments beyond that point as may best serve their conditions. The rules submitted are general in character and do not include any suggestions as to methods or recommended practice.

GENERAL RULES FOR THE GOVERNMENT OF EMPLOYEES OF THE MAINTENANCE OF WAY DEPARTMENT.

road
.....RAIL
way

GENERAL NOTICE.

To enter or remain in the service is an assurance of willingness to obey the rules.

Obedience to the rules is essential to the safety of passengers and employees, and to the protection of property.

The service demands the faithful, intelligent and courteous discharge of duty.

To obtain promotion, capacity must be shown for greater responsibility.

Employees, in accepting employment, assume their risks.

All employees in the Maintenance of Way Department must do all in their power to prevent accidents, even though in so doing they may occasionally have to perform someone else's duty.

ORGANIZATION.

(1) The Maintenance of Way Department on each Division is in charge of..... who will receive instructions from and report to.....
(2) It will be subdivided under the following heads:

Supervisors of Track.
Supervisors of Structures.
Supervisors of Signals.

(3) Supervisors of Track to report to and receive instructions from the.....

(4) Supervisors of Track are responsible for the safe condition and proper maintenance of the track and roadway. They must inform themselves of the condition of structures, make temporary repairs of such defects as may endanger or delay the movement of trains; and promptly report defective condition to.....

(5) They shall employ, in the discharge of their work, such men as are necessary for carrying out the duties for which they are responsible.

(6) They must know that all Foremen are provided with all rules, circulars, forms, and special instructions pertaining to their duties and that they fully understand and comply with the same.

(7) They must know that all Foremen are supplied with tools and material necessary for the efficient performance of their duties and must see that they are properly cared for and used.

(8) In the execution of the work under their charge, they must conform to the prescribed standards and plans.

(9) They will have immediate supervision of all work train service for the maintenance of track on their Division, and will employ such service only when authorized by the..... doing work by other means as far as practicable and economical.

(10) In cases of obstructions or damage to track or roadbed, they will go promptly to the spot with the force, tools and materials necessary to effect clearance and repairs.

(11) They must investigate and report on Form..... all accidents occurring in their district which may be attributable to track, roadbed or structures.

(12) They will see that no encroachment upon or occupancy of any portion of the Company right-of-way is permitted, except by au-

thority of the

(13) They will permit no experimental trials of appliances or devices not standard with the Company, or give out information of the results of any trial, except by proper authority.

(14) They will keep general oversight of all work performed in their district by contractors or others who do not come under their direct charge, and see that nothing is done by them that will interfere with the safety of track or movement of trains.

The committee states that it has in contemplation the formulation of rules covering the following points: Protection in case of obstruction of track; condition of under, over and grade crossings and proper protection of same; reporting neglect of any department whereby train movements would be jeopardized; personal attention to renewal or extraordinary work. Also the formulation of rules for the government of Supervisors of Structures and Supervisors of Signals, which will be submitted at the next meeting.

The report is signed by R. H. Aishton, Chairman; W. L. Derr, J. H. Abbott, C. N. Kalk, C. S. Millard, H. G. Prout, R. O. Rotz, H. J. Simmons, A. G. Trippier, H. U. Wallace, G. H. Webb.

COMMITTEE MEETINGS.

Track and Ballasting.—A joint meeting of the Committees on Track and Ballasting was held at the Auditorium Hotel, Chicago, November 29, with the following attendance: Messrs. Davis, Lee and Rose, representing the Committee on Track; Messrs. Paquette, Milner, Ranno and Rockwell, representing the Committee on Ballasting. The joint meeting decided on ballast cross-sections, to be submitted by the Committee on Ballasting in its annual report.

Buildings.—A meeting was held of the Buildings Committee at the office of the Association in Chicago, December 6. The subjects discussed were "Recommendation for General Waiting Room in Small Passenger Stations" and "Recommendations Relative to Requirements and Construction of Modern Roundhouses." These two subjects were carried to a conclusion. The general contract for use in buildings was also discussed, but no conclusion reached. Those present at the meeting were: Mr. A. R. Raymer, Chairman; Mr. E. B. Brown, Vice-Chairman, and Mr. E. C. Macy. Mr. H. M. Steele and Mr. L. D. Smith submitted written discussions on the subjects under consideration.

Masonry.—The Masonry Committee held its second meeting at the office of the Association in Chicago, December 7, with the following members in attendance: Messrs. E. C. Brown, John Dean, C. W. Boynton, A. O. Cunningham and J. W. Schaub. The report of the sub-committee appointed at the first meeting to prepare a report on the efficiency of concrete backing for stone face work, as to imbedding large stones in the interior of heavy concrete structures, as to the use of concrete under bridge seats in place of stone pedestals, and as to the economy and advisability of substituting reinforced concrete for the common forms of construction, was considered and embodied in the Committee's report. The subject matter of the annual report of the Committee was discussed in detail, and the chairman was authorized to prepare same for publication in the Bulletin.

Track and Rail.—A joint meeting of the Committees on Track and Rail was held at the headquarters of the Association, Chicago, December 12, Messrs. Davis, Lee, Hickey and Rose, representing the Track Committee, and Messrs. Hunt and Wordworth, representing the Rail Committee, being present. The instructions of the Board of Direction to formulate conclusions as to general requirements for a standard rail joint were discussed and the following conclusions reached: "It must connect the rails

into a uniform continuous girder; it must be strong enough to resist deformation or taking permanent set; it must prevent deflection or vertical movement of the ends of the rails and permit movement lengthwise for expansion; it should be as simple and of as few parts as possible, and be effective; finally, its cost must not be prohibitive."

The Track Committee also decided on definitions of gage (of track), fastenings and auxiliary fastenings. The chairman was instructed to draft the report for publication in the Bulletin.

Records, Reports and Accounts.—The sixth meeting of the Committee on Records, Reports and Accounts was held at the office of the Association in Chicago, December 19, Messrs. Wendt, Bloom, Woodward and Woods being present. The Committee was in session four hours and discussed and finally approved for printing the report for 1905.

Ballasting.—The Ballasting Committee held a meeting at the Association headquarters in Chicago, December 30, Messrs. Hanna, Milner, Ranno and Rockwell being present. The meeting discussed the subject matter of the report and approved it for final printing.

Board of Direction.—A meeting of the Board of Direction was held at the office of the Association in Chicago, December 15, Messrs. Hunter McDonald, H. G. Kelley, James Dun, Walter G. Berg, W. L. Breckinridge, A. W. Johnston, L. C. Fritch and E. H. Fritch being present.

The following nominations for officers for the ensuing year were made: President, Mr. H. G. Kelley; Vice-President, Mr. A. W. Johnson; Secretary, Mr. L. C. Fritch; Treasurer, Mr. W. S. Dawley; two Directors, Messrs. J. B. Berry, W. McNab.

The Board appointed the following Committee of Arrangements for the next annual convention, to be held in Chicago, March 21, 22 and 23: Mr. T. L. Condron, Chairman; Messrs. E. D. B. Brown, John Brummer, C. W. Hotchkiss, M. E. Shire, J. W. Schaub.

It was decided to hold the sessions of the convention from 9:30 a.m. to 12:30 p.m., and from 2:30 to 5:30 p.m. each day, and to hold an evening session on the night of March 21st.

Special Committee on Classification of Track.—The Special Committee appointed by the Board of Direction to classify railroad track into three classes for the purpose of fixing standards, has issued the following circular of inquiry:

Maximum weight of Locomotives in Freight Service:

(a) Without tender.

(b) Including tender.

Maximum single axle load of Locomotives in Freight Service.

Maximum weight of Locomotives in Passenger Service:

(a) Without tender.

(b) Including tender.

Maximum single axle load of Locomotives in Passenger Service.

Maximum single axle load of Loaded Freight Car.

Maximum schedule speed of Freight Trains.

Maximum actual speed of Freight Trains.

Maximum actual speed of Passenger Trains.

Freight train miles per annum per mile of division.

Passenger train miles per annum per mile of division.

Revenue Tonnage passing over division per year.

Approximate Gross Tonnage passing over division per year.

Freight Car Mileage per annum per mile of division.

Passenger Car Mileage per annum per mile of division.

State whether division is single or double track.

Classify all freight traffic of division approximately into three classes:

(a) Per cent. of live stock, refrigerator and fruit traffic.

(b) Per cent. of merchandise traffic.

(c) Per cent. of mineral traffic.

The above information to be given for important divisions.

ROADWAY.

After a resume of the work of the Committee in previous years, the following clauses are suggested for publication in the Manual of Recommended Practice:

This Association approves of the opinions of this Committee that on first-class roads of standard gage with constant and heavy traffic, a minimum permanent width of 20 ft. at subgrade is good practice.

That in the theory upon which the width of embankment at subgrade is based it is considered that the track in excavations is placed upon what is virtually a low embankment, and in order to preserve uniformity of conditions

does not deem it advisable to include specifications adopted at the last or previous meetings as they are incomplete and have never been considered except in part. The specifications are not printed herewith. Their value lies in their completeness, and the 82 paragraphs involved, together with the accompanying glossary of definitions, are intended rather to define existing practice than to make any modifications of importance. The accompanying illustrations show plans submitted by the committee for standard cross sections of roadbed. Attention is called to the fact that while the Association has expressed itself "that on first-class roads of standard gage with constant and heavy traffic a minimum permanent width of 20 ft. at subgrade is good practice," yet the Association, since this conclusion was adopted, has appointed a committee to submit plans for three classes of railroads. The drawings shown purposely omit details, with the idea of bringing out the views of the members of the Association. It will be observed that the classifications indicated by the letters A, B and C refer to widths of roadway at sub-grade varying from 20 ft. to 12 ft.

The report is signed by H. J. Slifer, Chairman; R. C. Barnard, Vice-Chairman; Geo. H. Bremner, C. Dougherty, W. I. Lee, W. D. Pence, H. C. Phillips, H. Rohwer, A. M. Shaw, A. K. Shurtleff, F. L. Stuart, and H. M. Waite.

TIES.

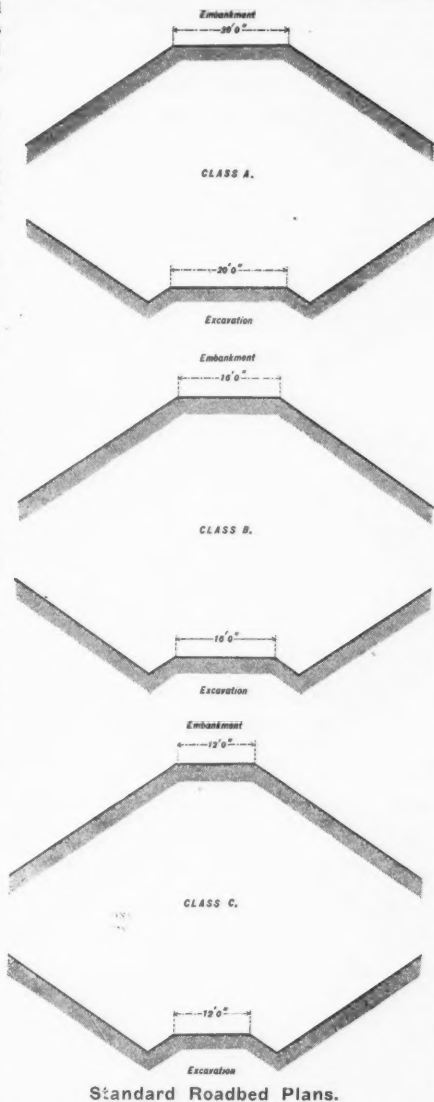
The report of the committee on ties contains the revised general specifications for ties in which are embodied the changes voted upon at the last convention and a few new items which seemed necessary to make the specifications complete. Under the head of woods to be used without treatment, "locust" has been qualified as "locust, excepting the honey locust." Black cherry has been added to the list. Some minor changes have been made in the first two paragraphs to make them comply with the proposed definition of "face" and to include half-round ties.

The committee has collected a large amount of data on the dimensions of ties in use, and this is included in tabular form in the report. A noticeable feature of the replies received is the large number of railroads which are using 6 x 8 x 8 ties with satisfactory results. There are two objections to this size; the first is the insufficient thickness to properly hold a 5½-in. spike, and the second is the insufficient as a beam to properly distribute the load. The first objection will be met by adopting a more efficient method of fastening the rail to the tie. The other objection is governed largely by the weight of the rolling load and the character of the roadbed and ballast.

Marking Ties.—Mr. Edwin F. Wendt has called attention to the experience of the Pittsburgh & Lake Erie with galvanized steel nails which after three years' service in the Pittsburgh Terminal yard at McKees Rocks had rusted so badly as to make the date entirely illegible. They have therefore substituted copper nails. The quality of the galvanizing seems to be poor, failing to meet the proposed specification. The committee has no data to determine what life should be given by a well-galvanized steel nail, but is endeavoring to secure such information and in the meanwhile considers it wise to adopt the following specification which is in use by the Western Union Telegraph Company and the American Telephone & Telegraph Company for galvanized wire.

The nail shall be of the specified size, made of steel, galvanized with a coating of zinc, evenly and uniformly applied, so that it will adhere firmly to the surface of the steel.

Any specimen shall be capable of withstanding the following test: The sample shall be immersed in a standard solution of copper sulphate for one minute and then removed, immediately washed in water thoroughly, and wiped dry. This process shall be repeated. If, after the



Standard Roadbed Plans.

immediately under the track throughout the line the width of subgrade in cuttings should be made the same as on embankments, outside of which sufficient room must be allowed for side ditches.

Local conditions and the character of material should invariably be taken into account in determining the permanent slopes of the roadbed cross-section.

Vol. 4, 1903, pp. 32, 34, 39, 44, 66, 74 (insert).

(1.) Similarity in form of specifications.

(2.) Measurements of clearing and grubbing shall be made in units of 100 ft. square.

(3.) A threefold classification of materials: Solid Rock, Loose Rock and Common Excavation, and in special cases such additional classification of material as may seem necessary, such additional classes to be distinctly defined and specified in the contract. (Amendment, Vol. 5, 1904, p. 688.)

The committee then presents a full set of specifications for roadway, saying that it

fourth immersion there is a copper-colored deposit on the sample or the zinc has been removed, the lot from which the sample was taken shall be rejected.

The standard solution of copper sulphate shall consist of a solution of commercial copper sulphate crystals in water. This solution shall have a specific gravity of 1.185 at 70 deg. Fahr. While a sample is being tested the temperature of the standard solution shall at no time be less than 60 deg. Fahr. nor more than 70 deg. Fahr.

Preservative Treatments.—There is little to report as to preservative processes or the results of treatment. So far as known, there has been one new treating plant built during the year in the United States and one in Mexico. No new treatments have been proposed. One plant is now treating ties in this country by the Rutgers zinc-croosote process. Practically all ties treated have been by the use of zinc-chloride. The records of the past year confirm the now prevailing opinion that treatment of cross-ties is necessary, desirable and profitable. Greater expense in higher-priced chemicals will produce greater life of the tie, but any of the usual treatments will prove profitable.

The Atchison, Topeka & Santa Fe presented some months since through the technical press, the statement of their results up to January 1, 1904. Up to that date they had used 9,068,105 ties. No accurate records are obtainable prior to 1897, but since then it is understood the records are as nearly correct as can be expected. The average life of all the ties removed since then is 10.6 years. During 1903, there were removed from tracks 3,278 ties out of 111,503 which had been treated in 1885, 18 years previous. From 1897 to 1903 there were removed 56½ per cent. of the ties treated in 1885. Of the 270,581 ties treated in 1897, 3.7 per cent. have been taken out. Of 648,184 treated in 1898, 1.7 per cent. were out. The ties referred to were treated by the zinc-tannin process.

In 1892 there were laid certain experimental ties on the Western Division of the Pittsburg, Fort Wayne & Chicago. These were untreated white oak, and tamarack and hemlock treated by the zinc-tannin process. Their life record can now be given in full, as all are out but 25 of the hemlock ties, which are to come out during the following summer.

Location.	Kind of ties.	Ballast.	Date laid.	No. removed on account of decay—											Total.
					1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	
Hanna...	Treated hemlock...	Rock.	1892, 200	1	4	6	...	39	38	29	58	25	200		200
Hanna...	Untreated white oak.	Rock.	1892, 200	...	8	46	26	9	45	66	...	...	...	...	200
Kosciusko	Treated tamarack...	Gravel.	1892, 200	...	2	71	84	43	...	...	...	...	...	...	200
Kosciusko	Untreated white oak.	Gravel.	1892, 200	...	2	27	73	71	27	...	...	...	...	...	200

Giving an average life, respectively, of 10.71, 10.17, 8.84 and 9.47 years.

The Chicago & Eastern Illinois began the use of red oak ties treated by the zinc-tannin process in 1899. They have put into track to date about 845,000 ties, of which 64 have been taken out of track. With untreated red oak probably nearly all of the first year's ties would now be out.

We have recently received a copy of a report on a test to determine the relative durability of sawed and hewed ties. The Missouri Pacific, in 1893, laid, in Western Kansas, 14,081 sawed and 3,950 hewed long leaf yellow pine ties. After seven years, 67½ per cent. of the sawed ties and 47.3 per cent. of the hewed ties were still in service. It is understood the sawed ties were practically all heart, while the hewed ones were pole ties, with unhewed sides. They were made with a full 8-in. width of face, however, so that the sap on the sides was in addition to the required width. An effort is being made to carry this record up to the present. The information is presented in the hope it may bring out other records of similar experiments.

Tie Records.—A few instructions for marking and reporting ties laid and removed are here-with submitted.

Section foremen are provided with daily record blanks having space for each day of the month to record the number of treated ties put into track that day and the number taken out the same day, the latter being divided according to the cause necessitating their removal, whether rotten, broken, burned or rail cut. The section foremen must make these records each day. They must also show the year in which these ties were treated as indicated by the stamp and by the dating nail. These records must be entered up each day, and at the end of each month the daily record must be forwarded to the proper superior officer. If no treated ties have been taken out or put into track during the month, section foremen must so note on report.

Treated ties already in track, but taken up and relaid on another part of the same section, need not be inserted on this report as ties taken out or put in.

Section foremen must see that a dating nail is driven in the upper side of every treated tie

when it is first laid in the track, about 10 in. inside of the rail, and on the line side of the track. The tie shall be laid with the end having the year stamp on it on the line side of the track. A supply of these nails must be carried on the hand-car whenever any ties are to be laid, and dating nail must be driven the same day the tie is put in.

Foremen must be especially careful to see that neither they nor their men injure or destroy the marks or nails intended to identify the ties.

At the end of each year all dating nails for that year remaining on hand and unused must be returned to the storekeeper, and requisition made for a new supply stamped with the following year.

It is recommended that, in addition to the use of the dating nail, each tie be stamped at the treating plant, before treatment, with the year; and, preferably, be stamped on both ends. Also that ties treated with mineral salts be seasoned four to six weeks before being laid in track.

The report is signed by E. B. Cushing, Chairman; W. W. Curtis, O. M. Dunn, C. F. W. Felt, E. Ford, R. R. Hammond, E. E. Hart, F. T. Hatch, W. K. Hatt, J. C. Nelson, S. M. Rowe, H. R. Safford.

RECORDS, REPORTS AND ACCOUNTS.

The committee on this subject (Committee XI) reviews what has been done in this field in former years and gives a summary of the things that should be published in the Manual of Recommended Practice. A proposed standard form for a time book is given which has, besides the ordinary tabular record of the work performed by each man each day, a diary, with six lines for each day of the month. A form is given for a section foreman's monthly material report, one for a lease record, and one for a register of title deeds. It is recommended that the section foreman's monthly material re-

ports of receipts for contracts and leases taken out of files, and (3) a six-page book giving references to contracts and leases, showing the date of expiration. The register of title deeds is Form M. W. 1011.

The committee consists of Edwin F. Wendt (P. & L. E.), Chairman; W. S. Kinneer, W. Archer, J. G. Bloom, H. Fernstrom, V. K. Hendricks, Paul Jones, B. S. Josselyn, W. S. Thompson, J. E. Turk, E. K. Woodward, H. A. Woods.

BALLASTING.

The committee report on ballasting summarizes briefly the work done in previous years and presents an outline for recommended practice for stone, gravel, cinder and burnt clay ballast together with proposed standard ballast sections for single and double-track.

Stone Ballast.—The specifications for stone

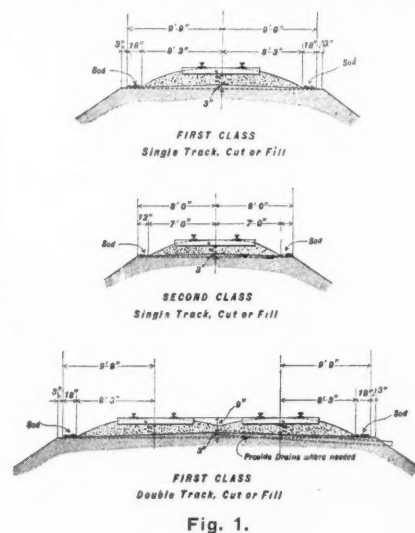


Fig. 1.

ballast are substantially the same as those adopted last year.

(1) Stone shall be durable enough to resist the disintegrating influences of the climate where it is used. It shall be hard enough to prevent pulverizing under the treatment to which it is subjected, and it shall break into angular pieces when it is crushed.

(2) The maximum size of ballast shall not exceed pieces which will pass through a screen having 2-in. holes. The minimum size shall not pass through a screen having ¾-in. holes.

Gravel Ballast.—Gravel should be screened or washed where prevention of dust is an object, but this need not be done where the character of the traffic is such that dust is not particularly objectionable. It is recommended that gravel be screened or washed where the proportion of sand or clay exceeds 50 per cent. The minimum size should be such as is retained on screens of 12 meshes per inch. By this is meant the size of pebble that would be retained after a thorough, careful test. No particular size or design of screen or arrangement of plant for screening ballast is recommended for the reason that sufficient information has not been obtained on these points up to the present time.

Cinder Ballast.—The use of cinders for ballast is recommended for the following situations: On branch lines with a light traffic; on sidings and yard tracks near engine houses; as sub-ballast in wet, spongy places; in cuts and on fills; as sub-ballast on new work where dumps are settling and at places where the track heaves from frost. It is recommended that some provision be made for wetting down cinders immediately after they are drawn from the ash pans of locomotives.

Burnt Clay Ballast.—The material should be black gumbo or other suitable clay, free from sand or silt. The suitability of the material should be determined by thoroughly testing it in small test kilns before establishing a ballast kiln. The material should be burned hard and thoroughly, using good, fresh fuel which will burn with a clean fire. It is important that a sufficient supply of clay and fuel be kept on hand to prevent interruption in the process of burning and the operation of the kiln should be under the supervision of an experienced and competent burner. The burnt clay should be allowed to cool before it is loaded out of the

port be made 14 in. x 17 in., but the sample given in the committee's report is only 8¼ in. x 12 in., so that it is not easy to judge as to the suitability of the form in its principal feature, size. In view of the limited clerical ability of the average section master, a report of this kind should be on a very large sheet; but most of the reports are a compromise between a sheet large enough to show the desired information and one small enough to be handled with reasonable convenience. Under the head of received, in this report, the committee has three columns: (a) by shipment; (b) taken out of track; (c) from track taken up. The items under the head of description of material appear to have been very carefully prepared. Scrap is divided into four classes: rails over 6 ft. long; rails under 6 ft. long; frog, switch and guard rails; miscellaneous. On the back of the report there is space for a diary of receipts and shipments, and a list of switch ties showing the number of pieces, old and new, of every length on hand; there are columns for 35 lengths. In the body of the report switch ties are entered in one item showing the total number of linear feet. This material report is form M. W. 1009.

Form M. W. 1010 is a sample of a right-of-way map, with a page of notes such as usually accompany such a map. The committee recommends that right-of-way maps in cities and towns be made 100 ft. to the inch; in other places 400 ft. to the inch; the latter to be on sheets not more than 18 in. wide. The lease record, Form M. W. 1012, consists of (1) a record, made up in a book of 100 pages; (2) a 50-page book for

pit. Absorption of water should not exceed 15 per cent.

Ballast Cross-Sections.—At a joint meeting with the committee on track, ballast cross-sections for two classes of track were agreed upon and are shown in the accompanying illustration, Fig. 1. Some of the members of the committee did not concur in the majority report, and presented a minority report, the illustrations from which are also shown herewith, Figs. 2 to 5.

Accompanying the report are two letters from members of the Association giving some interesting notes on the use of oyster shells and slag as ballast. Mr. F. L. Nicholson, Engineer of Maintenance of Way, Nor-

folk & Southern, says in regard to oyster shells:

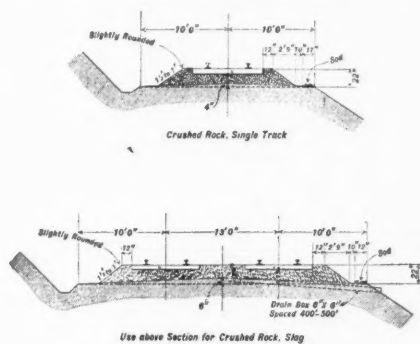


Fig. 2.

folk & Southern, says in regard to oyster shells:

"We find that oyster shells are the best for our purpose; they are purchased from oyster packers in this section at prices ranging from 2½ to 3½ cents per bushel. As we have no special cars for handling ballast, they are loaded into gondolas and by opening the doors partially, they are distributed on the track while the train is in motion.

"The drainage properties are almost perfect, therefore the life of the tie is extended—how much we are unable to say at this time. There is an entire absence of dust. They somewhat reduce vegetation but do not entirely prevent it. There is always more or less dirt mixed with the shells, and this with the lime will support life in certain kinds of weeds, and these have to be pulled out by hand. We now have about forty miles of track ballasted with oyster shells, and during the time we were ballasting there was

good, as after slaking it sets into a solid mass almost resembling concrete.

"In order to facilitate and cheapen the handling of slag many furnaces are now making it into granulated slag. The molten slag is run into a large cistern, and as it pours into it from the end of a trough it is met by a stream of water forced under pressure through a flat nozzle, and the action causes the slag to fly into fine particles somewhat resembling coarse sand. It is then dug out of the water with a clam-shell dredge. The product varies from sharp, hard and heavy, resulting from vitreous slag operated on with an excess of water, to soft, light and pumice-like, resulting both from too little water in the treatment, and from lime slag.

"The former kind makes an excellent ballast for yard work and on any tracks with moderate travel. It is easily worked and stays where it is put and has little dust. The soft kind, however, should be avoided as it is liable to set, although, to be sure, it will even then drain and do its duty as ballast so long as it is not necessary to disturb it."

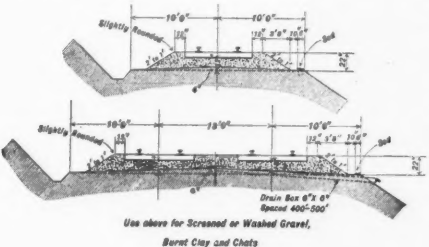


Fig. 3.

The report is signed by John V. Hanna, Chairman; C. A. Paquette, C. H. Byers, A. Q. Campbell, L. F. Goodale, G. D. Hicks, B. C. Milner, J. O. Osgood, F. W. Ranno, Samuel Rockwell, J. G. Sullivan.

YARDS AND TERMINALS.

The report reviews previous work of the committee, between 1900 and 1904, and submits a list of definitions and of recommendations from previous reports which need not be reprinted at this time.

The final recommendations submitted are considered to embody the general principles to be followed in yard design, although local conditions as to site or operation may frequently necessitate a deviation therefrom.

Body Tracks.—These should be spaced 11 ft. 6 in. to 13 ft. centres; and where they are paral-

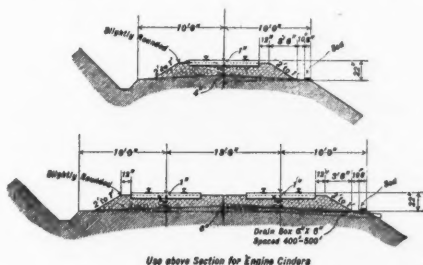


Fig. 4.

on an average one high-speed train per hour on this track. The following is table of particulars:

Oyster shells, bushels per mile.....	42,266
Oyster shells, cu. yd. per mile.....	2,113.3
Cost of shells per bushel.....	\$0.0274
" shells per cu. yd.....	.5480
labor per cu. yd. shells.....	.1744
Cost per cu. yd. in track.....	.7224
" mile for labor.....	368.64
" mile for oyster shells.....	1,158.62
Total cost per mile.....	\$1,527.26

"We paid our foremen at the rate of \$42 per month and laborers \$1 per day of ten hours."

The following notes on slag ballast were contributed by Mr. Samuel Rockwell, Assistant Chief Engineer, Lake Shore & Michigan Southern:

"Slag naturally falls under two heads: First, that which is hard and vitreous and that will not slake, and, second, that which will slake, this property being due principally to an excess of calcium and deficiency of magnesium oxides. Vitreous slag broken in sizes similar to broken stone makes fair ballast, but the lime slag is not

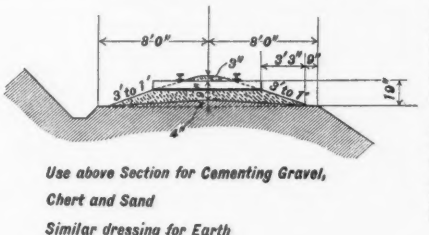


Fig. 5.

lel to the main track or other important running track they should be spaced 15 ft. c. to c. from said track.

Ladder Tracks.—These should be spaced 15 ft. c. to c. from any parallel track; and a No. 7 frog is the minimum number recommended for yard use.

Lead Tracks.—For safety the connections of these tracks with the main line should be interlocked; and to facilitate train movements, telegraphic connections should be established in the tower.

Drill Tracks.—These should be so located as to cause minimum interference with other movements.

Open Tracks.—The track selected as the open track should be one that will enable movements to be made from one end of the yard to the other with the greatest possible convenience.

Running Tracks.—These tracks should be provided for movements in either direction to enable yard engines to pass freely from one portion of the cluster or general yard to the other; also for road and yard engines to go to and

from the engine house and other points where facilities are located.

from the engine house and other points where facilities are located.

Crossover Tracks.—Crossovers should be located at the most convenient points, and where they will least interfere with regular movements.

Caboose Tracks.—These tracks should ordinarily be located between the receiving and departure yards and so arranged that the caboose can readily be pushed thereon from a receiving track and then dropped by gravity to the train departing in the direction from which the caboose has arrived.

Scale Track.—These tracks should be located between the receiving and separating yards.

Coaling, Ash-Pit, Sand and Engine Tracks.—These tracks should be located on the route leading to and from the engine house and should provide sufficient storage for the reception of engines by the hostler. They should be so arranged (1) that water, coal and sand can be taken and ashes disposed of in convenient rotation; and (2) that switching engines may clean fires, take coal, water and sand, and pass round waiting engines.

Bad-Order Tracks.—Where cars are classified, one or more of these tracks, easy of access, should be provided for setting off bad-order cars, and from which they can readily be removed to the repair tracks.

Repair Tracks.—These tracks should have a maximum capacity of about 15 cars each, spaced alternately 16 ft. and 24 ft. c. to c., and be connected conveniently with the bad-order tracks.

Icing Tracks.—These should be located between the receiving and separating yards so that the cars to be iced may readily be moved from the receiving to the icing track, and thence to the separating yard.

Cluster (or General Yard).—The Main tracks should be located on the outside of the cluster, or general yard, with the engine house situated in the center.

Freight Car Repair Yard.—(See repair tracks.)

Couch Cleaning Yard.—This yard should be located for ready and quick access to and from the station. The tracks should be long enough to accommodate trains without cutting; and should be stub-ended, preferably, with a car cleaner's repair and supply building located at right angles at their ends.

Inbound Freight House.—This house should be of such width as will furnish a reasonable amount of floor space for holding freight (50 ft. is a good average width). Usually not more than two tracks are needed, and these should be provided with platforms to avoid the necessity of spotting cars at the doors of the house.

Outbound Freight House.—In order to decrease trucking at this house it should be narrow (25 ft. is a good average width). It is of advantage to have a number of cars at the house so that all freight can be loaded into the cars direct; it is not advisable to load through more than four cars. Platforms should be provided between tracks to avoid necessity of spotting cars. Where a great number of cars are required the trucking distance will usually be decreased, and trucking through cars will also be avoided by having stub tracks running up to a freight house located at right angles to them; these tracks to be separated by covered platforms leading to the freight house.

Roadways.—Where the freight house is on one side and a wall on the other the minimum width of roadway should be 30 ft.; but where a freight house is on one side and a team track or another freight house is on the other the minimum clear width of roadway should be 50 ft.

Transfer House.—A transfer house should be located at a point where there is a coming together of the traffic and a necessity exists for its consolidation, and where the loaded equipment made empty can be used.

Cluster (or General Yard) at Rail-and-Water Terminals.—This should be so arranged that as trains come in the cars can readily be switched into the necessary classification and then moved to the proper point without interfering with the other movements.

Piers.—At rail-and-water terminals the piers should be designed with a view to the most efficient, rapid and economical handling of the business, and with a view also to the future development of this business. Care must be taken to give due weight to the special conditions and features of location, traffic, etc., which exist in every case and which render it impossible to lay down any but the most general rules for such piers. In every individual case the length, width, number of tracks, width of platform, details of construction and width of waterway between adjacent piers must be adjusted to best meet conditions as to shape and area of site as well as its relation to its approaches from both

*As previously adopted by the Association; no change recommended.

†Practically as previously adopted by the Association; slight changes made in wording so as to improve same; no change recommended.

land and water, the character and volume of the business, and the manner in which it is to be handled.

Covered Lighterage Pier.—When conditions will permit, present practice will generally suggest a length of approximately 600 ft., with two depressed tracks. If the business to be handled over the pier is expected to move quickly the width should be no greater than is necessary to provide temporary storage and shelter for the goods during ordinary detentions while waiting for cars or lighters, preferably about 100 ft. If the movement is expected to be slow and it is necessary to provide storage while waiting for cars or vessels, or for assorting, classifying, inspecting or sale of goods the width should be increased, but generally not beyond a width of 125 to 160 ft. If the movement is not expected to have a special character, or a mixed business is to be provided for, a compromise width of 125 ft. is suggested. The space between the shed and the outer edge of the pier should be not less than two feet, and the clear width of waterway between piers should be, if possible, not less than four times the width of the largest vessel to be handled.

Open Lighterage Pier.—This should, if possible, have a length of about 600 ft., and the width, number of tracks and the appliances for handling traffic should be adjusted to the particular use to which the pier is to be applied. On long piers, crossovers may be necessary.

For ordinary coarse freight in bulk, such as iron ore, stone, timber and similar products, the width should be from 50 to 80 ft., and there should be four tracks, with crossovers, to facilitate the handling of cars and avoid delay in transferring to or from vessels. If the business is light, or consists principally of heavy or costly products, such as cut stone, machinery, or miscellaneous freight not requiring shelter, a narrow pier of about 35 ft. in width, with two tracks only, is suggested.

Export and Storage Pier.—This should be designed with special reference to the character of the commodities to be handled; whether quick movement is expected or the goods are to be held some time in storage for the accumulation of full cargoes, or for inspection or classification. There should be two tracks in a depressed pit on the pier level, which, on long piers, should be properly connected by crossovers at convenient intervals to facilitate the movement of cars. On very wide piers additional tracks on the pier level are desirable under certain conditions. Where the water front is limited or very valuable and the conditions, volume and character of business warrant, pier sheds of two or more stories, with platform or barrel elevators and bag or barrel chutes are used. Under certain conditions additional tracks in the second story may prove more advantageous than elevators. The length should be sufficient to properly accommodate either one or two vessels on each side at the same time, or approximately 600 to 1,400 ft. The width must be determined by the space available and the business to be handled. If quick moving, a width of 125 to 150 ft. is recommended. If slow moving, and large accumulations must be received and stored, the width may be extended, if space permits, to 300 or even 400 ft., but excessive width is not recommended on account of the consequent increase in cost of handling. The space between shed and face of pier should not be less than three nor more than six feet, and the clear waterway between piers should be, if possible, not less than four times the width of the largest vessels to be handled.

Coal Pier.—This should be an open pier, and where coal is to be delivered to vessels through pockets and chutes in the ordinary way the pier should be high enough to allow coal from drop-bottom cars to be loaded by gravity into vessels or barges. It should have three or more tracks, the outside tracks for loaded cars and the inside one on an incline to return the empty cars to the yard by gravity. The length depends upon the grade necessary to reach the desired elevation, the length of the vessels to be coaled and the number of cars it is desired to unload at one time. Adjacent piers should be sufficiently distant to accommodate the class of service, which will depend on the length of the pier and the size of the water craft to be accommodated. Where coal cars are dumped by machinery which elevates and tilts the cars a high pier is not necessary, and it may be of any convenient height.

Station Pier.—A city station pier served by car floats should be approximately 600 ft. long and 125 ft. wide, with a depressed driveway in the center 35 ft. wide. It should be a closed pier, with a 3-ft. platform outside. Adjacent parallel piers should be, if possible, 200 ft. apart in the clear. Along the water street should be a bulkhead, approximately 50 ft. wide, with two-story building, the upper floor being for offices, fruit auction room, etc.

*As previously adopted by the Association; no change recommended.

Grain Elevators.—These should be so located that cars can be run into them and loaded or unloaded, the tracks being so located that cars will feed to and from the proper part of the cluster or general yard without interference with other movements. The tracks should be arranged to feed cars in at one end and out at the other. Where this cannot be done, the tracks should be so arranged as to allow shifts of cars to be made without stopping all work.

Following these recommendations, additional definitions were suggested for consideration and discussion. A paper on the Design and Operation of Division and Tide-water Terminals, read before the New York Railroad Club in December, 1903, by Mr. C. L. Bardo (*Railroad Gazette*, Dec. 25, 1903), is printed in the Bulletin. The following conclusions are also presented:

SUMMIT (OR HUMP) YARDS.

Definition.—A summit (or hump) yard is a yard which has a portion of its tracks elevated above the general elevation of the yard, for the purpose of giving cars which are being separated or classified an impetus by a down grade or incline which enables them to run on to the

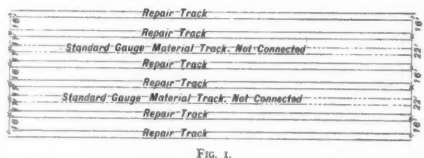


FIG. 1.

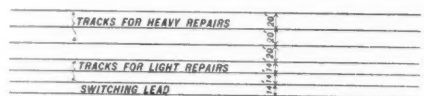


FIG. 2.

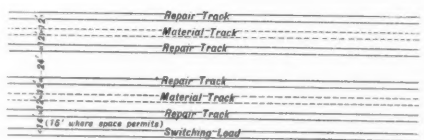


FIG. 3. (HEAVY REPAIRS.)



FIG. 4. (LIGHT REPAIRS.)

different tracks in the yard without other assistance. (See also technical definition.)

Elevation and Grades.—The amount of elevation of summit and rates of grades required vary with different kinds of cars and traffic handled, and also with varying climatic conditions; i. e., cars run easier in summer than in winter, loaded cars run easier than empty cars, etc. The tracks approaching the summit should be slightly up grade for about 75 ft., to insure cars being closed up, so they can be uncoupled rapidly. The exact grades of each summit must be determined by experience with the class of business handled, but fair average grades for this purpose are about as follows: From the summit down for 300 ft., 2 per cent.; thence down through the several switches in the yard, 0.7 per cent.; thence down through the remainder of the yard, 0.3 per cent. It may be stated that in general the grades after leaving the summit should be such as to carry the cars to their proper destination.

Location of Scales.—When scales are located on the summit they should be so placed that when the cars reach the scales they will be running slow enough to render correct weighing easy. The distance of the scales from the summit, and also the rate of grade, should be such that the car as it reaches the scales should be separated from the cars following.

Length and Number of Yard Tracks.—The lengths of tracks required for summit yards will vary, being dependent largely upon the existence of receiving, classification and departure yards. When all these conditions exist, the receiving tracks should be long enough to hold full-length main line trains; the classification tracks should be about one-half the length of the receiving tracks (cars being taken to provide a sufficient number of tracks for the classification desired), and the departure tracks should all be of full train length. In case there is no departure yard, the tracks of the receiving and classification yards should both be of full train length. The number of tracks in the receiving yard should be sufficient to hold the maximum number of trains that may be received in two hours. The number of tracks in the departure yard should be sufficient to hold the maximum number of trains made up in six hours, so that delay in despatching trains may not limit the working capacity of the yard.

Rating Car Standing Capacity of Tracks.—Forty linear ft. of track per car seems to be the universally recognized rule for distance assumed in rating car standing capacity of freight yard tracks. No other distance has been suggested, and hence your committee feels safe in recommending 40 ft. as good practice.

Car Repair Yards.—This subject has been quite fully covered in a former report of the committee. (See Vol. 3 of Proceedings, 1903, pp. 259 and 267, and but little additional matter has been obtained.) Heavy car repair tracks should be under cover, and provided with overhead cranes, to facilitate heavy lifting. They should preferably be short, of a capacity of 10 to 20 cars each and arranged in pairs; the tracks of each pair should be spaced 16 ft. centers, and the pairs themselves 40 ft. centers. For other spacing, as well as additional suggestions, see the accompanying sketches, Figs. 1 to 4.

Team Delivery Yards.—These yards should be located convenient to the freight house, so that the receipt and shipment of freight may be easily under control of the freight agent's force. The tracks should be arranged in parallel pairs; the tracks of each pair should be spaced 12 ft. centers, and the pairs themselves 48 ft. centers. The yard should be provided with a crane for loading and unloading heavy freight. Additional tracks should be provided adjacent to a considerable ground area, where derricks can be located and material unloaded and piled ready for delivery by team. Such a layout is very desirable in handling building material for large buildings, and also for unloading and liberating cars which otherwise might have to be held under load for various causes. The driveway should be paved with gravel or broken stone for ordinary work, but where there is much trucking it should be paved with stone blocks. Some smooth pavement, such as brick, may be employed for sanitary reasons, where large quantities of perishable freight are handled.

It is desirable to limit the length of team tracks to about 20 cars capacity, to facilitate switching operations. They should be subtended at a main driveway connecting all other driveways. Wagon scales should be provided handy to team entrance to yard; and track scales should be provided and located for convenient switching.

The report is signed by the following committee: W. G. Besler, E. E. R. Tratman, J. A. Atwood, A. B. Corthell, E. P. Dawley, W. A. Garrett, F. O. Melcher, G. F. Morse, I. G. Rawn, C. S. Sims.

TRACK.

The report of the committee on track contains little new or original matter, being simply a summary of the work of the committee of previous years. That part of the report which deals with maintenance of gage and inspection of track was presented to the Association last year but was not acted upon. It is resubmitted this year substantially unchanged. The report is signed by Garrett Davis, Chairman; E. H. Lee, William Ashton, J. R. W. Davis, T. H. Hickey, C. B. Hoyt, D. MacPherson, F. L. Nicholson, L. S. Rose, J. C. Lesser, F. S. Stevens.

BUILDINGS.

The report of this committee is divided under three heads:

1. Standard form of contract for railroad buildings.
2. Recommendations relative to one general waiting room, or separate waiting rooms, in local passenger stations without reference to separate waiting rooms for colored people.
3. Recommendations relative to the requirements of a modern roundhouse.

Standard Form of Contract for Railroad Buildings.

The following form of contract is submitted as covering the general requirements for railroad buildings. It is based on the standard form recommended for general use

*As previously adopted by the Association; no change recommended.

by the American Institute of Architects and the National Association of Builders.

This agreement, made this.....day of....., in the year one thousand nine hundred and....., by and between....., party of the first part (hereinafter designated the Contractor) and....., party of the second part (hereinafter designated the Company),

Witnesseth, that the Contractor, in consideration of the payments and covenants hereinafter mentioned to be made and performed by the Company, agrees with the said Company as follows:

Article I. The Contractor shall and will provide all transportation, materials, and perform all the work for the completion of.....

..... as described in the specifications herewith and as shown on the drawings prepared by the Company, which drawings are identified by the signatures of the parties hereto or by their representatives, and which become hereby a part of this contract.

The materials used under this contract shall, as far as is possible, be procured at points served by company lines or their connections and shipped via them.

Article II. It is understood and agreed by and between the parties hereto that the work included in this contract is to be done under the direction of the Chief Engineer of said Company, and that his decision as to the true construction and meaning of the drawings and specifications shall be final. It is also understood and agreed by and between the parties hereto that such additional drawings and explanations as may be necessary to detail and illustrate the work to be done are to be furnished by said Engineer, and the Contractor agrees to conform to and abide by the same so far as they may be consistent with the purpose and intent of the original drawings and specifications referred to in Article I.

It is further understood and agreed by the parties hereto that any and all drawings and specifications prepared for the purposes of this contract by the said Engineer are and remain the property of the company.

Article III. No alterations shall be made in the work as designated, except upon the written order of the Engineer; the amount to be paid by the Company or allowed by the Contractor by virtue of such alterations will be stated in said order. Should the Company and the Contractor not agree as to the amount to be paid or allowed, the work shall go on under the order required above, and in case of failure to agree, the determination of said amount shall be settled by arbitration by three persons, the Company to select one, the Contractor one and these two the third.

Article IV. The Contractor shall provide sufficient, safe and proper facilities at all times for the inspection of the work by the Engineer or his authorized representative. The Contractor shall, within twenty-four hours after receiving written notice from the Engineer to that effect, proceed to remove from the grounds or buildings all materials condemned by the Engineer or his authorized agent whether worked or unworked, and to take down all portions of the work which the Engineer shall by written notice condemn as unsound or improper, or as in any way failing to conform to the drawings and specifications, and shall make good all work damaged or destroyed thereby at his own expense.

The Contractor agrees to keep a competent man on the work at all times during working hours, authorized to receive and carry out the instructions of the Engineer.

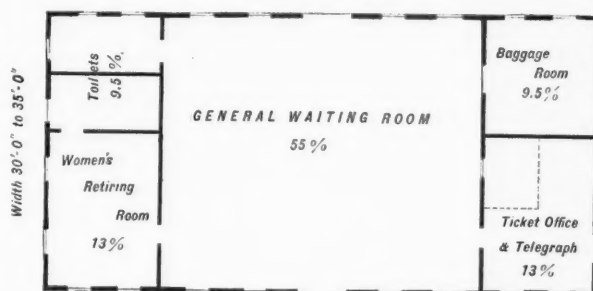
The different branches of the work under this contract are intended to be and are included in one contract, with the Contractor solely responsible for all work and men employed. The Contractor shall not assign this contract nor sub-let or transfer the whole or any part or parts of the work under it to any other persons or corporations (excepting for the delivery of materials) without the consent of the Engineer, in writing, but will give personal attention and superintendence to the work, and the Contractor will not be released or discharged from any responsibility or liabilities under this contract owing to such assignees, sub-contractors

or their agents, employees or servants being allowed to engage in the work now under this contract.

Article V. The Company reserves the right to suspend operations on the work under this contract or on any particular part or parts by giving the Contractor twenty (20) days' notice, and in the event of such right being exercised, the Engineer shall grant to the Contractor an extension of time equal to the time of suspension of the work. It is further understood and agreed that on such suspension the Contractor may have the option to close and settle up for the work done according to the estimate of said Engineer; such suspension or settlement of the work, however, shall not entitle the Contractor to any claim for damages; or if the Company shall postpone or suspend the work under this contract indefinitely or altogether, which it reserves the right to do, then in that case the Engineer shall prepare a final estimate of the value of the part of the work done, such estimate to include any materials purchased and delivered to the Contractor or specially designed and ordered for the work under this contract the same as if the work had been completed, and this contract shall thereupon be terminated. All materials paid for and included in such final estimate that are not on the property of the Company shall be delivered to the Company before such estimate is made. The canceling of this contract shall not entitle the Contractor to any claim for damage or for anticipated profits on it.

In case the Contractor should become financially embarrassed and unable to prosecute the

Length 80'-0" to 90'-0"



TRACK FRONT

Proposed Standard Plan for Small Stations.

work diligently or fail to pay promptly bills or wages incurred for the work, or any one or more of joint Contractors shall become bankrupt, or make a general assignment for the benefit of creditors, or if the property of any such Contractor or Contractors shall be levied upon or taken in execution or under attachment or by any judicial process whatsoever, or if by reason of insolvency or bankruptcy he or they shall be unable to fulfil the covenants herein contained fully and effectively according to the true intent and spirit thereof, the Engineer at his discretion, acting for the Company, may at any time declare this contract or any portion embraced in it terminated.

Should the Contractor at any time refuse or neglect to supply a sufficiency of properly skilled workmen, or of materials of the proper quality, or fail in any respect to prosecute the work with promptness and diligence, or fail in the performance of any of the agreements herein contained, such refusal, neglect or failure being certified by the Engineer, the Company shall be at liberty after twenty (20) days' written notice to the Contractor, to provide any such labor or materials, and deduct the cost thereof from any money then due or hereafter to become due to the Contractor under this contract.

In case the work under this contract shall be assumed by the Company, as provided above, the Engineer shall have the authority and right, at his discretion, to take possession for the Company and make use of the plant and of any or all construction materials, both such as enter into the completed work and such as are required during construction, delivered by the Contractor at the site or in the vicinity of the work, the fair value of such materials as enter in the work so taken to be established by the Engineer, and such value, less any previous payments made for such materials, shall be allowed and paid to the Contractor in the final estimate or settlement of his account as for so much work done under this contract.

Article VI. The Contractor agrees to commence the work covered by this agreement within.....days after the date hereof and to complete the same on or before.....

Article VII. Should the Contractor be delayed in the prosecution of the work by any other Contractor employed by the Company upon the work, by acts of his employees, or by strikes caused by his employees, or by any damage caused by fire, lightning, earthquake, cyclone, or any other casualty for which the Contractor is not responsible, then the time herein fixed for the completion of the work shall be extended for a period equivalent to the time lost by reason of any or all the causes aforesaid, the length of which extended period shall be determined and fixed by the Engineer, but no such allowance shall be made unless a claim therefor is presented in writing to the Engineer within forty-eight hours of the occurrence of such cause.

Article VIII. It is hereby mutually agreed between the parties hereto that the sum to be paid by the Company to the Contractor for the work covered by this contract shall be the sum of..... For..... subject to additions and deductions as hereinbefore provided, and that such sum shall be paid by the Company to the Contractor, On or about the first day of each month, during the progress of this work, an estimate shall be made by the Engineer of the relative value of the part of the work done up to such time, and upon his certificate of the amount being presented to the proper official of the Company, or such disbursing agent as the Company may appoint, the amount of said estimate, less a retained 15 per cent., and less previous payments, shall be paid to the Contractor on or about the twentieth day of each month for the work done in the previous month at the nearest disbursing point of the Company to the Contractor's office.

If demanded by the Engineer, said Contractor shall furnish to said Company or Engineer receipts, vouchers, affidavits, schedules, all permits, etc., required by State and Municipal Laws and Ordinances; or if at any time there shall be evidence of any lien or claim for which, if established, the Company might become liable, and which is chargeable to the Contractor, the Company shall have the right to retain out of any payment then due or thereafter to become due an amount sufficient to completely indemnify the Company against such lien or claim.

The final payment shall be made subject to releases, after the completion of the work included in this contract. The Contractor shall furnish to the Company or Engineer, if deemed necessary by the Engineer, all releases or waivers of lien, claim or right of claim of said Contractor and of sub-contractors and of all persons furnishing materials or labor hereinunder who might have a lien therefore. Should there prove to be any such claim after the final payment is made the Contractor shall refund to the Company all moneys that the latter may be compelled to pay in discharging any lien or claim on said premises arising from work done on property or material furnished hereinunder, the Contractor to refund such amounts to the Company before the bond covering the work is declared released.

It is further mutually agreed between the parties hereto that no estimates given or payments made under this contract, except the final certificate of final payment, shall be conclusive evidence of the performance of this contract, either wholly or in part, and that no payment shall be constructed to be an acceptance of defective work or improper materials.

Article IX. Wherever in this contract the term "Contractor" is used it represents the party of the first part to this agreement, and the term "Company" represents the party of the second part.

Wherever in this contract the term "Engineer" is used, it is understood (unless otherwise specified) to mean the Chief Engineer of the Company, or his duly authorized agents, limited by the particular duties respectively intrusted to them.

Article X. The Contractor shall supply the Company with a good and sufficient bond acceptable to the Company to the amount of 25 per cent. of the contract price, for the faithful carrying out and completion of this contract; and the bond shall remain in force until ninety days after the final payment is due.

Article XI. The Contractor shall, during the progress of the work, maintain full insurance on said work, in his own name and in the name of the Company, against loss or damage by fire; the policy shall cover all the work incorporated in the building, and all materials for same in or about the premises covered by this contract, and shall be made payable to the parties hereto as their interests may appear. The Contractor shall also carry insurance upon his employees, and in case of accident and suit occurring on same, he is to defend the suit in person and relieve the Company from all cost and expense and pay any judgment that may be recovered thereon.

The Contractor assumes all responsibility for any loss or damage that may happen to said

work or to the materials therefor, or for any injury to the workmen or to the public or to any individual, or for any damage to the Company or other parties adjoining property.

It is further agreed that the Company shall not in any manner be answerable or accountable for any violation of State or Municipal Laws or Ordinances as far as they may be applicable to the carrying out of the work. The Contractor shall indemnify the Company against any such loss or damage or consequences of violation of any such laws or ordinances.

Article XII. The said parties for themselves, their heirs, executors, administrators, assigns and successors do hereby agree to the full performance of the covenants herein contained.

In witness whereof, the parties to these presents have hereunto set their hands and seals, the day and year first above written.

Signed, sealed and delivered
in the presence of

..... The.....
..... (SEAL)
..... By
..... By
..... (SEAL)

Waiting Rooms for Local Passenger Stations.

The committee recommends a floor plan for local passenger stations closely approximating in arrangement and proportions that shown in the accompanying drawing. This arrangement has the following advantages: It allows the general waiting room to be properly proportioned. It permits a retiring room for women with private entrance to their toilet room. It admits all other rooms to be proportioned to the needs of the station. It allows easy access from the agent's room to the train platform, to the baggage room and to the waiting room. It allows the train crews to register and "O. S." in the ticket office. The station can be enlarged or made smaller in size without changing the common arrangement. A station building of this character can be heated economically and the shape of the building permits of wide variation in the architectural treatment.

Requirements of a Modern Roundhouse.

The committee recommends that a modern roundhouse be designed and equipped as follows:

(1) That the form be circular and that normally the locomotives stand in the house, with the tender toward the turntable.

(2) That the distance from center of turntable to the inner side of roundhouse shall be determined by the number of stalls required in the full circle. The length of stall along center line of track should be not less than 85 ft. in clear.

(3) That the clear opening of entrance doors should be not less than 12 ft. in width and 17 ft. in height. That the angle between adjacent tracks should be an even factor of 180 deg., so that the tracks at the opposite ends of the turntable will "line up" with it.

(4) The turntable should be not less than 75 ft. long. The table should be operated by power, preferably electric.

(5) The material used in the construction of the house should be non-corrosive, unless proper care be taken to prevent corrosion.

(6) Engine pits should be not less than 60 ft. long, with convex floor, and with drainage toward the turntable. The walls and floors may be of concrete, and proper provision should be made for the support of the jacking timbers.

(7) Roundhouse doors should roll or fold and be made of non-corrosive material, unless the cause of corrosion be removed.

(8) Smokejacks should be fixed, having large hoods; constructed preferably of non-corrosive material and supplied with dampers. The cross-section of the stack should be not less than 30 in. in diameter.

(9) The floor should be of vitrified paving brick laid flat on a concrete foundation

and grouted. It should be crowned between pits, and that part adjacent to pits within jacking limits should be of wood.

(10) Drop press should be furnished for handling truck wheels, driving wheels and tender wheels. These can be most economically constructed in pairs.

(11) The building should be heated with hot air by the indirect method, and the supply should be taken from the exterior of the building (no recirculation of air should be allowed). The air should be delivered to the pits under the saddle of the locomotive. Air ducts should be located under the floor and special precautions should be taken to keep them dry.

(12) As much light should be obtained from the exterior of the building as good construction will allow.

(13) There should be an arc light, and a plug socket for incandescent lights in each space between stalls.

(14) The contents of boilers should be taken care of and discharged outside of the building in a suitable receptacle and the heat units used as may be deemed best.

(15) Cold water should be supplied at each alternate space between stalls from an outlet not less than 2½ in., located at a point about opposite front end of firebox; the water pressure should be not less than 80 lbs. The hydrants should be located below the floor in properly constructed pits amply drained. Modern practice requires the use of hot water in the maintenance of boilers.

(16) Compressed air should be used for mechanical hoisting and blowing operations. Overhead outlets should be furnished in each space between stalls opposite front end of firebox. The pressure should be from 80 to 100 lbs.

(17) A modern roundhouse should have facilities for the location of a few necessary machine tools, preferably electrically driven.

(18) Air hoists, or portable gooseneck cranes with differential blocks, on wheels, should be furnished for handling heavy repair parts.

(19) The turntable pit side walls should be of concrete with wooden coping not less than 6 in. thick, and the ties under the circular rail should be supported on concrete walls. Pivot masonry may be of concrete with stone cap.

The report is signed by A. R. Raymer, E. D. B. Brown, B. C. Gowen, E. C. Macy, L. D. Smith, H. M. Steele.

WATER SERVICE.

This committee report is signed by G. M. Davidson, F. A. Delano, J. A. Bernard, A. McGill, C. A. Morse, R. S. Parsons, E. J. Pearson and J. C. Stuart. Reference is made to the fact that 40 railroads in this country now have water-softeners whereas but 27 roads had such plants when last year's report was written. This report is divided into three parts or problems, each of which is discussed at length. The summary of conclusions for each problem follows:

Water-Softening Methods and Plants for Different Conditions.

(1) All water used in locomotive boilers contains scale-forming matter in solution or suspension, that is the cause of much trouble and expense in operating and maintaining locomotives.

(2) In locating water stations along a railroad, an investigation should be made of all the available water supplies, and care should be taken to avoid the use of poor water, or to curtail its use as much as possible.

(3) If hard water is used, the hardness should be removed before it is put into locomotive boilers.

(4) Hard water can be softened by treating it with chemicals. The chemicals generally used are lime and soda ash.

(5) The chemical method of softening water, commonly used to-day, has been known for many years.

(6) The mechanical methods of modern water-softeners are new and differ widely.

(7) Water, whose hardness is due to carbonates of lime and magnesia, can be softened by the use of lime alone, without adding any soluble salts to the softened water.

(8) Water, whose hardness is due to sulphates of lime and magnesia, can be softened by the use of soda ash, but in this case soluble sulphate of soda will be added to the softened water.

(9) A water-softening method best adapted to any condition can be determined only after a study of that condition.

Comparison of the Cost of Installing and Operating Water-Softening Plants, with the Benefits Derived from Their Use.

(1) The cost of installing a water-softening plant varies according to the capacity of the plant, its type, cost of material and labor in its locality, and other local conditions.

(2) The cost of operating a water-softening plant varies according to the efficiency of the water-softening apparatus, and cost of lime and soda ash in its locality.

(3) The cost of chemicals required to soften water varies according to the quantity of hardening matter in the water, and also its composition.

(4) If the hardening matter consists of carbonates of lime and magnesia, the cost of chemicals for softening the water will be very little, because common lime is the only chemical required.

(5) If the hardening matter consists of sulphates of lime and magnesia, the cost will be higher, because it will be necessary to use soda ash, or some more expensive chemical.

(6) The average cost for chemicals and labor on the Santa Fe was 2.8 cents per 1,000 gallons; on the Northwestern it was 1.8 cents per 1,000 gallons; on the Southern Pacific the average cost for chemicals only was 4.4 cents per 1,000 gallons, and on the Union Pacific it was 1.3 cents per 1,000 gallons.

(7) The benefits derived from water-softening plants are: Fewer boiler failures due to leaking; longer life of flues and firebox sheets; reduced cost of labor for repairing and washing boilers; increased locomotive mileage between shoppings; increased ton mileage per pound of coal consumed; decreased number of locomotives in service; shorter time required for locomotives to go over the road; better feeling among the men, due to fewer failures and shorter time on the road; less expense in cost of overtime and delayed time.

General Conditions Under Which the Installation of a Water-Softening Plant Would Produce Savings.

(1) If a railroad runs through a region where hard water is the cause of trouble and expense, it would undoubtedly benefit that railroad to install water-softening plants. The actual benefits obtained from water-softening plants by the five railroad companies referred to under Problem II are evidence of this.

(2) If a railroad has increased the size of its locomotives and found that it has more boiler troubles due to hard water than it had with the smaller locomotives, it would be a benefit to install water-softening plants.

(3) It would be a benefit to soften any water used in locomotive boilers that contains 15 or more grains per gallon of hardening matter, or even less than 15 grains, if the hardening matter consists largely of sulphate of lime.

(4) It would not be of much benefit to soften a water that contains 50 grains per gallon of alkali salts before treatment, and also a considerable quantity of sulphate of lime, for, although the water can be softened so that it will not make scale, yet it will cause trouble from foaming.

SIGNALING.

Committee No. X on signaling and interlocking presents standard arrangements of signals at interlocking plants; 18 diagrams and 11 conclusions on this branch of its subject (interlocking) and a report and six conclusions on manual block signaling. This report will be more fully treated in a future issue.

MASONRY.

The report of the committee on masonry rounds out the work of previous years and takes up little that is new. The joint committee of the American Society of Civil Engineers, American Society for Testing Materials, American Railway Engineering and Maintenance of Way Association and Asso-

ciation of Portland Cement Manufacturers which was appointed to consider the subject of reinforced concrete in all its phases has done little work during the year other than to appoint a sub-committee to consider the plan and scope of the tests and investigations which should be made in this field. Extracts from the preliminary report of this sub-committee are included in the report on masonry to show in a general way the lines along which the work of the joint committee will be conducted.

It is no reflection to say that our knowledge of reinforced concrete is very imperfect. The very newness of this construction explains the lack of information and the diversity of opinion concerning it. But the lack of information and experience in this work and the carelessness or temerity of inexperienced and incompetent persons make the danger from accident and failure of structures great. The importance of securing definite and complete knowledge of the principles underlying reinforced concrete construction before a serious accident caused by imperfect or improper construction injures the standing of reinforced concrete, is too apparent to need argument. The properties of concrete are not as regular or as well defined as those of such materials as structural steel, and the composite structure of steel and concrete may be expected to have a different action from that of the individual components. Recent investigations seem not to confirm certain deductions considered by many to have been established. The need of a thorough and comprehensive investigation of the properties of reinforced concrete and of the principles underlying its design and construction is evident, and the sub-committee recommends that such an investigation be undertaken under the auspices of the joint committee and emphasizes the importance and timeliness of such action to the engineering and constructional interests of the country.

It seems best to begin with elementary matters and to get at the subject from the foundation up. As the investigation proceeds the conditions accompanying tests already made may be more accurately learned and trustworthy data of such tests collected, and the collation of this information may be made a valuable part of the undertaking. However, the main purpose of the investigation should be to establish principles independently of existing opinions, or of preconceived ideas, and the principal present use of existing available data will be to direct the nature and scope of the work and to avoid unwarranted assumption.

"The scope of the investigation will include both (a) the determination of fundamental principles and properties, and (b) the choice of the main general conditions and requirements controlling the more common designs and construction. As the investigation proceeds, the results may be utilized without waiting for the completion of the work outlined, and in the selection of the order of the work to be undertaken the choice will be such that items of probable immediate applicability will be taken up first. This attention to the order of the tests is warranted by the desire of railroad and structural men to get facts upon which to base construction at as early a day as possible.

The plan is to have tests made in the laboratories of engineering schools, railroads, etc., which have facilities for the work and which upon consultation express willingness to co-operate. It is expected that much of the work will be done as thesis work by senior engineering investigators. Certain expenses will be defrayed from funds raised by the Committee on Ways and Means. Tests along special lines may require that special arrangements be made, and special appar-

atus may have to be provided. A committee to be known as the Committee in Charge of Tests will supervise the work.

It is proposed by the plan to take up at the beginning the more simple constructions and the more fundamental principles and basic properties. Especial attention will be given to reinforced concrete beams, though columns and slabs will be taken up and plain concrete will be investigated to determine its properties and constants so far as they have a bearing upon reinforced concrete. Among the problems, variations, and determinations for reinforced concrete beams included in the scope of the work are the following: Amount of reinforcement; form, size and position of reinforcing bars; variety and consistency of concrete; carefulness of concrete making; repetition of load; manner of application of load; form of section; resistance to shearing; efficiency of devices and arrangements to resist shear; bond and anchorage; effect of age; general investigation of manner of failure and of the critical or controlling condition upon which the design of beams should be based. It will be seen that emphasis is placed on the stress-deformation relation, as this has so important a bearing on the action of reinforced concrete beams.

The scope of the work may be modified and extended as the development of the investigation warrants. Special problems coming up may need attention. It may be well in the report of the committee to formulate general regulations for the proper execution of work in reinforced concrete construction. It should be stated that the plan contemplates tests of reinforced concrete, using that term to mean a construction composed principally of concrete and having a small amount of metal so imbedded as to take the principal tensile stresses and perhaps the secondary tensile and shearing stresses developed, but not to any great extent the compressive stresses, and does not include what may be termed steel-concrete, meaning thereby steel structures encased in concrete and using the concrete principally for stiffening and protection.

The outline of the plan and scope is arranged as follows:

1. Properties of Concrete.—A. Compression; B. Tension; C. Shear; D. Flexure; E. Columns; F. Volumetric changes; G. Fire resisting properties.

2. Properties of Reinforced Concrete under Simple Stresses.—A. Compression; B. Tension; C. Initial Stresses; D. Bond and anchorage.

3. Reinforced Concrete Beams.—A. Simple flexure; B. Complex flexure; C. Restrained beams; D. Impact tests.

4. Reinforced concrete columns.

5. Reinforced concrete slabs.

The testing work will include: 1. Materials and mixing; 2. Test pieces; 3. Testing.

The Adaptability of Concrete to Certain Phases of Railway Construction.—The committee made some investigations of present practice among railroads in order to present at this time recommendations as to the efficiency of concrete backing for stone face work; as to imbedding large stones in interior of heavy concrete structures; as to use of concrete under bridge seats in place of stone pedestals, and economy and advisability of substituting reinforced concrete for the common forms of construction for small openings.

Concrete Backing for Stone Face Work.—There seems to be no question as to the efficiency of concrete backing for stone face work, but as a combination structure is more expensive than a straight concrete structure, it is desirable to combine the two only under certain conditions. Where sufficient care is taken, no difficulty is experienced in securing

a satisfactory bond between a stone face and a concrete back. The best result is obtained from a wet concrete. As this is not a form of construction to be adopted because it is superior in any way to either stone or concrete masonry, but is a form which may be desirable and successfully applied under certain conditions, the committee can only recommend methods of procedure with which satisfactory results can be obtained.

It recommends that in this form of construction the face work be constructed after the usual manner, the back being left as rough as possible. To make the bond between the face and back more certain, headers should project well into the concrete. The work should be constructed in courses, and the backing brought up flush with each course of face stone. Portland cement concrete made in accordance with the standard specifications of this association, is recommended for this form of construction. The concrete must be sufficiently wet to conform readily to the rough contact surface of the stone facing.

Imbedding Large Stones in Interior of Heavy Concrete Structures.—Imbedding large stones in concrete is not a common practice among railroad engineers, because conditions seldom exist that, from an economical standpoint, favor this form of construction. In massive work, where weight is more of a factor than strength, rubble concrete can safely be used; therefore, in such work the question would resolve itself into one of comparative cost. Apparently one point of weakness in this form of construction is the fact that it is difficult to place the rubble stone so that the joints will be broken. Wet concrete is favored for this form of construction, as it is easier to force it to conform to the outline of the rubble stone, and a more perfect bond between the two materials is obtained. The rubble stone should be placed a sufficient distance apart to permit perfect tamping of the concrete. The relative size of the rubble stone to the thickness of the wall is a point that should receive attention.

The committee recommends the use of rubble concrete wherever a saving would result, provided the wall or structure in question is not less than 4 ft. thick. The greatest diameter of the rubble stone must not exceed one-half the thickness of the wall or structure. The rubble stone should be drenched, before placing, and care must be exercised to avoid continuous vertical joints. A Portland cement concrete made in accordance with this Association's standard specifications is recommended for this form of construction. The concrete must be sufficiently wet to conform readily to the rough surface of the rubble stone, but not so wet as to permit the segregation of the rubble stones. The thickness of the concrete between the rubble stones and the exterior of the wall must not be less than 1 ft. The rubble stones should be placed on their natural bed, and the minimum distance between them must not be less than 6 in.

Use of Concrete Under Bridge Seats.—Concrete has been and is being used extensively and successfully under bridge seats, there not being a single case reported where concrete bridge seats failed to do the work expected of them. Concrete bridge seats have been successfully used in bridges up to 200-ft. span. They are successfully constructed from the same grade of concrete as used in the pier or abutment, except that a smooth finish is obtained by the use of a cement and sand mortar on the top.

The committee recommends the use of concrete bridge seats under all ordinary conditions where the body of the pier or abutment is constructed of concrete, using a slightly richer mixture in the coping than in

the body of the structure. A Portland cement concrete made in accordance with this Association's standard specifications is recommended for the construction of bridge seats. In constructing concrete bridge seats, the work should be continuous, no time intervening between finishing the body of the structure and placing the bridge seat. The bridge seat should be finished on the top with a mortar composed of one part Portland cement and two parts sharp sand and troweled smooth. This top finish should never be less than 1 in. thick.

Reinforced Concrete for Small Openings.—This form of construction for small openings seems to have many points of advantage, among them ease of construction, low first cost, durability, etc. The value of the concrete arch constructed of plain or reinforced concrete is well known, and is usually preferred wherever the conditions will permit of its use. The use of the flat-top structure is more limited than that of the arch, but because of the economy with which it may be constructed and the limited head room required, it is a very convenient and desirable form, and it is a form with great possibilities. There are certain forms of I-beam construction in which the I-beams carry the load and the concrete protects the metal from corrosion, that should not be classed as reinforced concrete. Such construction, although very effectual, consumes a large surplus of metal, and therefore is not economical. There is little room for doubt as to the question of economy of straight reinforced concrete structures compared with the common form of construction for small openings. It is advisable to substitute reinforced concrete for the common forms of construction for small openings, but the flat-top structure should be studied in detail and an approved form recommended for the consideration of the Association. It is suggested that this subject be assigned to the committee for investigation.

The report includes the revised standard specifications for cement as adopted by the American Society for Testing Materials, June, 1904, and the committee recommends them for adoption by the Association as standard for railroad work.

The report is signed by E. C. Brown, Chairman; John Dean, C. W. Boynton, W. W. Colpitts, A. O. Cunningham, W. B. Hanlon, C. M. Mills, H. W. Parkhurst, A. F. Robinson, J. W. Schaub, G. F. Swain, E. P. Weatherly.

New Interlocking on the Southern.

The Southern Railway has lately established the manual block system on its line from Alexandria to Orange, 78 miles, and in connection with the improvement has established passing tracks with interlocked switches and signals at nine points. This line is now double-track through from Alex-

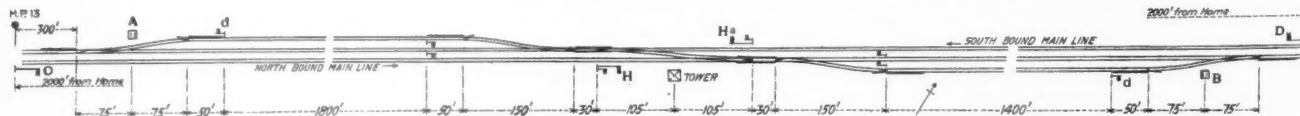


Fig. 5—Switches and Signals at Edsalls, Va., Southern Railway.

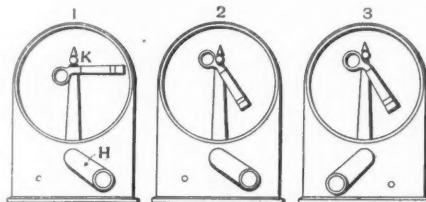
andria to Orange, and the block-signal sections are as follows:

Alexandria to Edsalls	5.7 miles.
Edsalls to Burkes	7.1 "
Burkes to Clifton	7.1 "
Clifton to Manassas	5.8 "
Manassas to Nokesville	6.8 "
Nokesville to Calverton	6.8 "
Calverton to Bealeton	6.5 "
Bealeton to Brandy	8.7 "
Brandy to Declaire	7.4 "
Declaire to Buena	8.1 "
Buena to Orange	8.0 "

A typical arrangement of switches and signals is that at Edsalls, Va., a plan of which

is shown in Fig. 5. For trains passing through on the main line the home signals H and Ha serve as starting signals, these and the distant signals being the only high signals in the plant. For trains starting out of the side tracks dwarf starting signals are provided, as at d d. Dwarf signals are also provided for all low speed movements, as shown. The distant signals are worked by electric motors, each of which is run by current from a primary battery situated in the base of its post. The signal is controlled by a separate lever in the interlocking machine.

The switches at the out-going ends of the



Figs. 1, 2 and 3—Indicator at Switch.

passing tracks, which are from 1,800 ft. to 2,500 ft. from the tower, are worked by two-lever dwarf machines, fixed at the switch. On the dwarf machine is an electric lock and indicator, controlled from the tower, and so connected with the interlocking as to prevent improper movements of the switch.

On dwarf signals situated like those fixed at the base of the home signals H and Ha the lights at night are blinded when the blade is in the normal position, so that they never show red to a train running at speed.

In Fig. 1, showing the electric switch-controlling box for remote switches, K is the in-

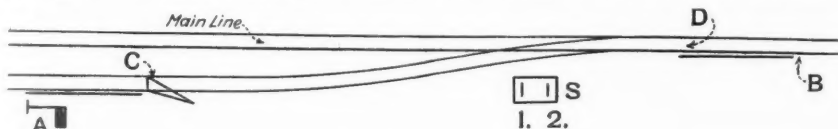


Fig. 4—Outgoing End of Sidetrack.

indicator and H the locking handle. The indicator is at stop. In Fig. 2 the indicator is at proceed and the machine locked. In Fig. 3 the indicator is at proceed and lever No. 2 is unlocked. Trainmen are instructed that the locking handle must be in the position shown in Fig. 1 or Fig. 2 before they leave the machine.

Fig. 4 shows a diagram which is printed in the instructions to the trainmen for working the switch at the out-going end of passing tracks. In this diagram S indicates the switch machine. The instructions are as follows:

1. Stop train at Signal A.
2. Remove cover of indicator and see if it shows proceed or stop.
3. Do not attempt to move any levers until it shows proceed.

4. When indicator is at proceed first pull locking handle out and swing to left, which unlocks lever No. 2.

Pull lever No. 2, which sets switch D for passing track and unlocks lever No. 1.

Pull lever No. 1 which closes derail C and puts signal A in the proceed position.

5. The train may now proceed out on to the main line.

6. When train has passed out and cleared the end of the detector bar (B) return levers Nos. 1 and 2 to their normal positions; after which swing locking handle back to right, close the cover of indicator and lock padlock.

Note.—The cover of indicator cannot be re-

placed until locking handle is swung to right.

Note.—A train must never be run over switch D except in a trailing direction. This means that no trains are to be run from the main line to the passing track over switch D.

All of this signal work was put in by the Union Switch & Signal Company. The motors in the distant signals are that company's type B, and the semaphore spectacles are the three-light pattern, arranged to turn 60 deg. The signal posts are of iron and the foundations of concrete. Most of the distant signals are from 2,500 to 3,000 ft. from the home signals.

Maintaining Railroad Repair Shop Machinery.*

BY M. K. BARNUM.

If I were at the head of the Mechanical Department of a railroad and should be required to choose between an old shop fully equipped with strictly up-to-date machine tools and a new shop provided with traveling cranes and other similar modern appliances, but in which a lot of old tools were to be retained, I would unhesitatingly prefer the former as being the most efficient means of maintaining the rolling stock and the best investment of the railroad company's money.

There is one railroad whose shops a few years ago were full of worn out and obsolete machinery and in spite of large purchases of locomotives the conditions grew so bad that it was impossible to maintain the power in good working order; engine failures increased to three times the average on neighboring roads, and the train service became utterly demoralized. Finally an emergency existed and as a last resort it was decided to buy some new machinery.

The obsolete tools were replaced with up-to-date machines and some additions made to the equipment of all the shops, which resulted in an increase of over 50 per cent. in the output of locomotives and that with less than a 10 per cent. increase in shop payrolls. Engine failures were reduced by two-thirds and a steady improvement was made each month in the condition of power.

Another railroad company has an old locomotive erecting and machine shop containing only 21 pits, but this shop turns out with general repairs, from 45 to 50 engines a month. Whenever any machine can be replaced with one which will earn 10 per cent. or more on the investment the old one is discarded, and this practice has necessitated throwing out upwards of \$25,000 worth of

old machinery within the last few years, but it has also resulted in a shop well supplied with up-to-date tools and with none that are really obsolete.

This shop overhauls each month from 2 to 2½ locomotives on each pit, while most other railroad shops average about one a month to each pit. It is hardly necessary to add that the management is very progressive and efficient. The same policy is followed

*From a paper presented to the March meeting of the Western Railway Club.

largely in all the shops of the road under consideration and the average cost of repairs per locomotive last year was less than \$1,600, while it ranged between \$2,000 and \$3,000 for most other roads.

Some idea of the tenacity with which railroads cling to old machinery may be obtained from the lists below, showing the age of all the shop tools owned by two roads, neither of which can be considered an exception to the general rule:

Age of tools.	A B C R.R.		X Y Z R.R.	
	No. of tools.	Per ct. whole.	No. of tools.	Per ct. whole.
Less than 10 years.	517	33	193	24
10 to 20 years old.	472	31	269	33
20 to 30 " "	193	12	113	14
30 to 40 " "	137	9	102	12½
40 to 50 " "	15	1	12	1½
Not known; very old.	211	14	129	15
Total	1,545	100	814	100

Please note particularly that 36 per cent.

any machine. Some machines wear out or become unprofitable to operate much sooner than others, but I believe an allowance of 5 per cent. a year is conservative and will average about right for railroad shops. A table is submitted herewith, giving the number and value of the tools in six shops located on different roads. The names of the roads and location of the shops are withheld for obvious reasons, but they are all actual figures for existing shops which will afford a good idea as to the value of machinery in shops of different sizes: viz., those having a capacity for giving general repairs to 60, 120, 216, 300 and 600 locomotives a year respectively. None of these shops is over 25 years old, and some are quite recent, and all have a sufficient quantity of machinery for the amount of work to be done:

more efficient for many kinds of work than planers and it is possible to do a great variety of work in drill-presses which was formerly done in lathes and boring machines. A modern steel tired car-wheel lathe will turn out six pairs of wheels a day while some of the older machines turn out only three or less, which represents a saving by the new machine of about \$2.50 per day or earnings of 20 per cent. on the investment. Modern turret lathes will do from two to five times more work than an ordinary engine lathe, and automatic stud machines will reduce the cost of studs from \$2 or \$3 a hundred to about \$1 a hundred. Vertical boring and turning mills will do at least double the amount of work that is possible on an engine lathe and occupy less shop room.

Old stationary engines are often very

Items.	Shop A.		Shop B.		Shop C.		Shop D.		Shop E.		Shop F.	
	No. of tools.	Value.	No. of tools.	Value.	No. of tools.	Value.	No. of tools.	Value.	No. of tools.	Value.	No. of tools.	Value.
Machine shop	30	\$16,655	50	\$56,573	122	\$134,975	113	\$99,043	160	\$133,816	178	\$196,400
Tin and pipe shop (includes bench tools)	12	105	11	400	48	383	20	2,700	42	630	55	850
Boiler and tank shop (includes furnaces, clamps, etc.)	6	750	6	5,724	36	25,680	23	21,327	23	24,450	24	48,580
Blacksmith shop (includes hammers, etc., forges)	1	1,200	5	3,746	15	14,350	13	11,957	12	15,450	25	18,500
Planing mill	..	..	24	10,154	33	12,681	57	12,353	..	..	..	..
Total	49	\$18,710	96	\$76,597	254	\$188,069	226	\$147,410	237	\$174,346	282	\$264,330
Five per cent. of total	..	935	..	3,830	..	9,403	..	7,370	..	8,717	..	13,216
Shop holds—Locomotives	5	..	9	..	16	..	22	..	22	..	50	..
Capacity, locomotives a year	60	..	120	..	216	..	300	..	300	..	600	..
Area locomotive erecting shop, sq. ft.	..	..	13,163	..	19,688	..	30,000	..	26,532	..	85,854	..
Area of machine shop, sq. ft.	..	..	20,837	..	19,687	..	44,600	..	44,220	..	74,605	..
Area of boiler and tank shop, sq. ft.	..	..	13,320	..	22,620	..	56,730	..	25,232	..	77,503	..
Area—total for three shops, sq. ft.	..	..	47,320	..	61,995	..	131,330	..	95,984	..	237,962	..

of the X Y Z road's tools are over 20 years old, while about one-sixth of the machines of each road are over 40 years old.

After a new shop is built and equipped, most railroad companies seem to think it can be operated and maintain its efficiency indefinitely without renewals or additions of machinery, but after 15 or 20 years they find the cost of work increasing and the shop output decreasing and then they may wake up and place a big order for new machinery. One road recently bought nearly \$200,000 worth of machine tools at one time for its old shops, but it would have been much better policy to buy some machinery every year, as each machine could be selected with more care and the merits of the different makes and patterns of machines could be more carefully investigated and those chosen which were best adapted to the particular work to be done. By this plan it would also be possible to more promptly equip new machines with the small tools and special devices for holding and doing work which are so necessary to obtain the maximum output.

A "Machinery Depreciation Fund" should be started by every railroad company for maintaining the efficiency of its shop tools. Some companies now have such a fund for replacing cars and locomotives which are wrecked or worn out, but I believe none has yet made any such provision for maintaining its shop equipment.

The tools in each shop should be listed and valued according to their age and condition, the inventory showing for each tool the following information:

1. Location of shop on the road.
2. Location of tool in shop—as tool room, boiler shop, etc.
3. Kind of tool and brief description.
4. Weight of tool approximately.
5. Name of maker.
6. Date when made.
7. Present condition.
8. Original value.
9. Depreciated value, allowing 5 per cent. depreciation a year until reduced to scrap value at ¾ c. a pound, which would be the minimum value that should be placed on of all the A B C road's tools and 43 per cent.

An annual appropriation of 5 per cent. of the value of the machinery in each shop would practically renew it once in every 20 years and maintain it in a fair state of efficiency.

I believe the most successful manufacturers figure on renewing their machinery oftener than this—once in 10 or 15 years for manufacturers of tools, etc., and cotton mills once in seven to 10 years—but I do not think it necessary to renew railroad shop machinery quite so often.

By referring to the list of shops it will be seen that a railroad owning 200 locomotives can maintain its shop equipment in efficient condition by an annual appropriation of about \$7,000, while \$17,000 and \$30,000 would be ample to keep up-to-date the shops of roads having respectively 600 and 1,200 locomotives. This 5 per cent. annual appropriation should not be expected to cover tools for new shops which have to be built on account of extending the road or making large additions to the rolling stock, although it might in some cases be possible to apply a part of it to such improvements. When a new shop is built and equipped the 5 per cent. annual appropriation should be allowed to accumulate until the money will earn 10 per cent. by replacing those machines which have become unprofitable to continue in use on account of wear or because of more efficient machinery having been designed.

I would advise bunching the valuation of the machinery in all the shops on any one road and applying the 5 per cent. per annum of the total for improvements in those shops where it would do the most good. This would be much better than to confine the 5 per cent. appropriation to each individual shop or sub-shop. Those tools should first be replaced which are most unprofitable to continue in service, and in buying new tools those should be selected which will effect the largest earnings. I have observed instances where this has not been done; for example, instead of buying ordinary engine lathes, it would be more profitable for most shops to buy turret lathes, vertical boring and turning mills, automatic stud machines, milling machines, etc. Milling machines are

wasteful. I remember one instance where an old engine operating a planing mill was replaced with a new one and as soon as the latter was installed the output of the shop was increased fully 20 per cent. and the new engine, although of higher horse-power, was found to use less steam than the old one. In most railroad shops the benefits to be derived from using high speed tool steels are largely nullified by old and light machinery.

J. M. Gledhill in a paper presented at the October, 1904, meeting of the Iron and Steel Institute, and printed in the *Railroad Gazette* Feb. 3, 1905, gave some interesting examples of the work which is made possible by using high-speed tool steel. In one example a 12-in. lathe of special design and strength for rapid and heavy cutting, turned from a rolled steel bar 40 large bolts in 10 hours, removing 1¼ tons of metal at a speed of 160 f.p.m., thereby saving all forging, and finishing five times as many bolts as were formerly turned by self-hardening steel in an ordinary lathe. "In fact, the cost of forging bolt alone (formerly) amounted to more than the present cost of producing to required form 12 such bolts by high-speed machinery." In speaking of planers he says: "The old cutting speeds of 15 to 25 f.p.m. are now replaced by those of 50 to 60 and even 80 f.p.m., and the power absorbed does not increase in anything like the same proportion as the extra amount of work done, so that the wear and tear on the machine is not materially increased." But it is safe to say that not one railroad shop in 10 has a single lathe or planer capable of exerting the power and speeds which Mr. Gledhill cites as necessary to obtain the greatest economy from high-speed tool steel.

The importance of well equipped tool-rooms in railroad shops seems to be very generally under-estimated, but I have observed that shops which are best managed and which turn out the largest number of locomotives in proportion to their size and the amount of machinery, are the ones which have excellent tool-rooms and first class men in charge of them. There are railroad shops where labor unions have strongly opposed the introduction of labor-saving tools, but

this is very unwise on the part of the unions. Such obstructive efforts are bound to fail, as there is no instance in history where men have finally succeeded in opposing the march of progress and the introduction of modern labor-saving inventions.

Two things are especially necessary in a locomotive repair shop to make the work move briskly; namely, the machine work must be turned out promptly and in sufficient quantity, and the boiler work must not be allowed to drag and delay the erecting gangs. In order to obtain these results, the equipment of the machine and boiler shops must be maintained in a high state of efficiency. Most railroad companies go on buying engines and cars and increasing their size, but are slow to appreciate that their shops are no larger and the machinery not as good as 10 or 20 years ago when the cars and locomotives were smaller and less numerous. Have you ever stopped to think of the amount of machinery that could be bought with the purchase price of one locomotive? Or has it ever occurred to you that if your company would reduce its last order for locomotives by one or two and use the amount so realized for new shop machinery, the returns on the investment would be greater and would give more than an equivalent in engines by increasing the output of the shops and decreasing the length of time each locomotive must be held under repairs? It is far more profitable for any railroad company to have small or medium sized shops well equipped to crowd the work and overhaul engines promptly, than to have larger shops not so well equipped in which engines must be held from 30 to 40 days each for repairs. Take, for example, two railroads each having shops with a capacity for overhauling 50 engines a month, one of which keeps under repairs 23 engines at a time and is thoroughly well supplied with up-to-date machinery, so that the average time each locomotive is held in the shop for general repairs does not exceed 14 days; but the other shop, which keeps 50 engines under repairs at all times, is not so well equipped, and they are held 30 days each. The road owning the smaller well equipped shop will have out of service for repairs but 23 engines at a time, while the company having the larger shop, not so well equipped, must keep 50 engines in the shop all the time to obtain the same output—50 locomotives a month. Therefore, the latter road will lose the service of 27 locomotives which the former has available for use, representing at a rental of \$15 a day, a loss of \$405 a day, or \$147,825 a year. This is a fair comparison based on results obtained in actual shops. Will it not pay every railroad company to adopt a plan for systematically maintaining its shop machinery in a high state of efficiency?

Railway Signal Association.

At the meeting of March 14th, held at the Great Northern Hotel, Chicago, 75 members were in attendance, and 29 new members were elected. Mr. Pfisterer (N. C. & St. L.) offered an amendment to the by-laws so as to have the March meeting held on the third Monday of the month, owing to close proximity of dates for the meeting of the Engineering and Maintenance of Way Association. By the proposed arrangement members will be encouraged to attend the sessions of both associations.

Committee No. 7, the Line Wire Committee, presented a preliminary report which, after some discussion, was referred back with instructions to make recommendations at the annual meeting. Paragraphs 30 to 39 of the standard specifications were discussed. The Committee on Definitions and

Nomenclature presented a preliminary report which will be considered at the May meeting. There was some discussion on the paper on storage batteries, read by Mr. Reynolds at the last New York meeting, and some data were given concerning the cost of this power on the Lackawanna and on the Missouri Pacific.

On the Lackawanna the storage batteries have now been in operation for several months on the main line near Elmira, N. Y. This equipment was described in the *Railroad Gazette* of Jan. 6, 1905. The system extends from Halstead to Elmira, approximately 70 miles. This section of the road is double-track and there are 160 signals in service. At each signal are installed 10 cells, type PT., having a capacity of 24 ampere-hours, five of these cells being used on the signal circuit while the other five are being charged. The cells are located permanently at the signals and charged over a transmission line, which transmission line obtains current from four generating stations, spaced approximately 20 miles apart. The cost and operating expenses are compared as follows:

<i>Storage Battery, First Cost:</i>	
Line wire, underground wire & cross arms	\$12,092
Four charging stations	1,096
Four charging outfits	1,932
Storage batteries and storage battery panels	3,500
Total	\$18,620
<i>Primary Batteries, Polish, First Cost:</i>	
2,500 cells at \$2 per cell	\$5,120
160 battery boxes	1,040
Labor, installation	320
Total	\$6,480
<i>Storage Battery, Operating Expenses:</i>	
Maintenance of cells per year, 10 per cent	\$376
Charging current, per year	240
Total	\$616
<i>Primary Batteries, Operating Expenses:</i>	
Two renewals per cell per year at 75 cts.	\$3,840
Excess labor over that required for storage batteries	1,200
Total	\$5,040

This shows a saving by the storage batteries of \$4,424 per year, or approximately 24 per cent, of the increased investment, exclusive of interest. The \$1,200 represents the service of two battery men dispensed with. The charging stations are managed by the signal maintainers. The cost for current is estimated from the amount of gasoline which it takes to run the engines to charge the batteries.

On the Missouri Pacific they operate 159 semaphore electric motor signals (100 miles) on which they formerly used 16 primary cells to each signal, or a total of 2,544 primary cells. The cost for renewals per year was approximately \$1 per cell, or \$2,544 a year.

In place of these primary cells they now have in service 111 sets of storage batteries, each set consisting of four cells, or a total of 444 cells; and 21 extra sets of four cells each, which are used while some are charging. The cost of each set of four cells is approximately the same as 16 cells of primary battery. As there are 132 sets of storage, as against 159 sets of primary, there is a difference in favor of the storage battery of 27 sets, or approximately \$864 in first cost. The batteries are charged at a central charging station and they employ for placing and taking care of the cells on the road, one man at \$60 a month. He devotes two days a week to batteries on the road and two days a week to charging batteries; and he could take care of at least one-third more batteries.

The Missouri Pacific has been using storage batteries now for somewhat more than 10 months without any cost whatever for renewals. The type of battery used most extensively is one weighing about 55 lbs., having a capacity of 66 amperes at eight volts. It is very satisfactory. These batteries are not charged in place, but are removed to a central station. One set of batteries is

in operation about a month between charges. In one or two cases, however, through some error a battery has not been charged for two months, but no trouble was experienced as the battery had sufficient capacity for two months' service.

The original investment for apparatus to charge the batteries amounted to about \$130. This included a small charging generator, switchboard instruments and a small panel. They already had a gasoline engine. Signal Engineer Mann believes it safe to estimate the saving in operating cost through the use of storage batteries at 50 per cent.

A New Locomotive Drifting Valve.

For the last 12 months the Wabash has been using a new type of locomotive drifting valve, the details of which are shown herewith. Over 150 locomotives, running in all kinds of service, have been equipped with this device. By its use it has been possible to discard relief valves on slide valve engines and do away with by-pass valves on both compound and piston valve locomotives. It is also claimed that economy in oil, fuel and repairs has been obtained by the use of this valve on the modern high-speed passenger locomotives and has otherwise given satisfaction. A decided reduction in the number of brasses requiring filing and fitting at terminal points has been noticed. In descending grades with the throttle closed, the device tends to overcome the retarding effect otherwise experienced.

A steam pipe "A" leads from the steam dome of the locomotive boiler to the turret "B," to which is attached a globe valve "C," connecting with what is termed a drifting valve "E" by the pipe "D." The drifting valve "E" is operated by a handle working in the quadrant "F," which opens or shuts the valve "E." To the valve "E" is attached a pipe "H" running through the stuffing box "G" (which can be made for either straight or sloping boiler head). The pipe "H" is connected with the throttle box at "I." The object of this arrangement is to take dry steam from the dome as indicated by the arrows, and introduce it into the cylinders through the connections mentioned and dry pipe "J." The globe valve "C" regulates the supply of steam from the turret "B" and the engineer controls the steam by the handle "F" through the drifting valve "E." When the engine is running or drifting with the throttle valve closed, the position of the reverse lever need not be disturbed. While the engine is in motion the drifting valve is open, and when the engine is standing at stations the valve is shut. It is claimed that the introduction of steam to the cylinders in small quantities when the engine is drifting assists in the lubrication of the cylinders and valves, thus saving at least 25 per cent. in oil. The temperature of the cylinders is also increased and condensation reduced, thereby making a saving in fuel. The operation of this valve relieves compression by destroying the vacuum, and keeps the engine running smoothly without shock, thus making a reduction in repairs. The suction of smoke and cinders into steam chests and cylinders and the consequent cutting of valve seats and cylinders is prevented. It also prevents the metallic packing from being knocked down and broken.

While this drifting valve is doing splendid work on simple engines, it is especially adapted to the compound and piston valve type. With the use of this drifting valve all by-pass, over-pass and relief valves are taken off entirely, and experience proves an increased efficiency in locomotives so arranged and equipped.

An oil cup "K" is used for oiling the main valves of the locomotive while drifting in

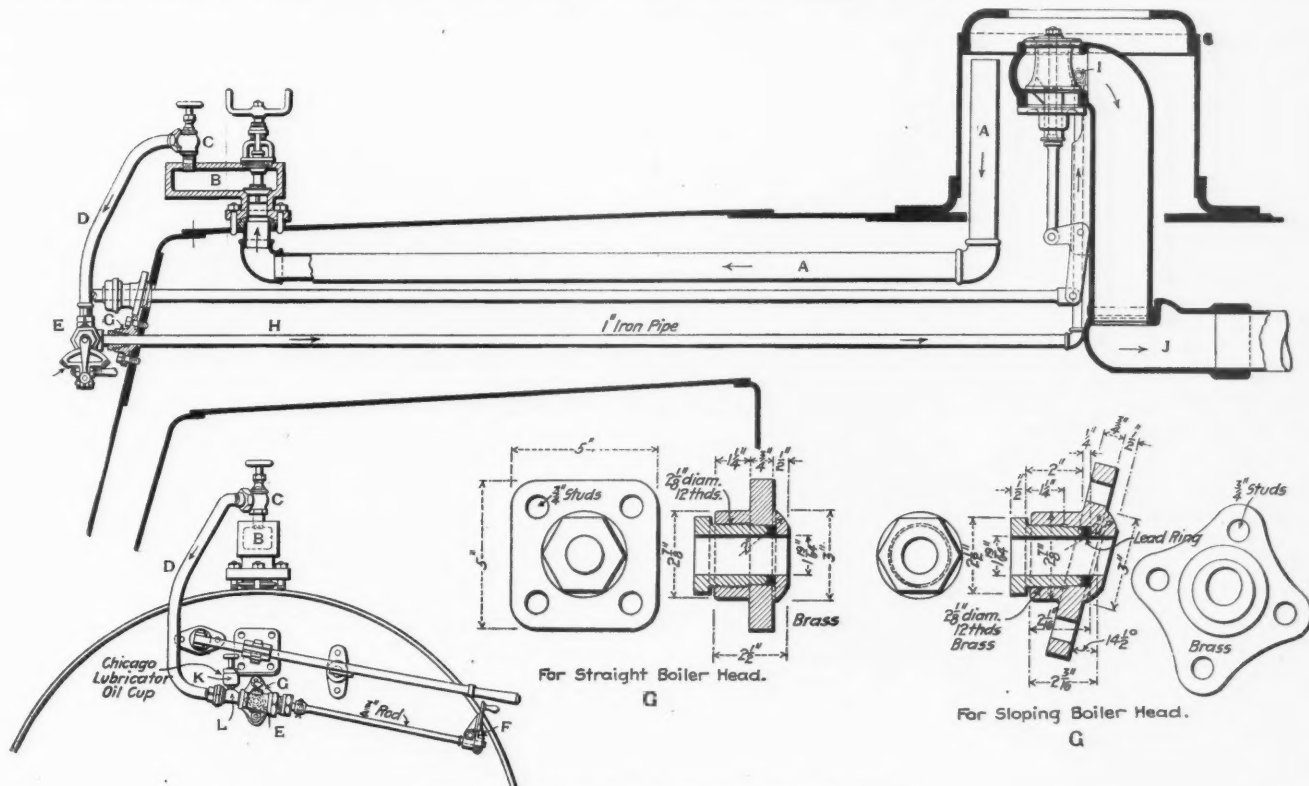
case of failure of the lubricator. To operate the cup, the valve "C" is closed and the cup "K" is opened which allows oil to be drawn into the steam chest and cylinders by suction. While the engine is standing, the valve "C" is closed and the cup "K" is opened, after which the pipe "H" is filled full of oil. The cup "K" is then closed

Scherzer Bridge Over the Swale River.

During the last two years an interesting piece of reconstruction work has been in progress on the Sittingbourne & Sheerness branch of the South Eastern & Chatham Railway, England. Some time before it was found advisable to cease opening the bas-

in a form that could be operated successfully, especially as an action had already been brought by a local Board of Waterway Conservators to compel the railroad to fulfil the original conditions of an opening span.

Under the circumstances the Board of Directors consulted Sir Benjamin Baker,

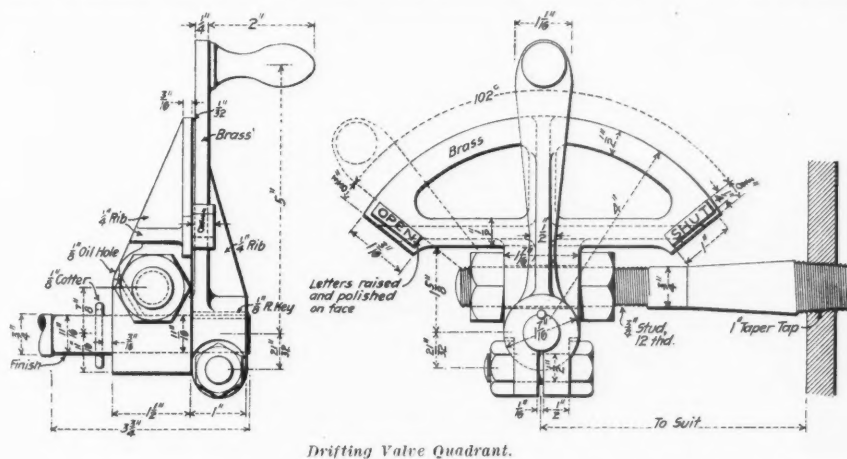


General Arrangement of Locomotive Drifting Valve.

and the valve "C" is opened and the oil will be immediately carried into the steam chests and valves by the steam pressure from the boiler. The nipple "L" provides a convenient place for the attachment of the oil cup "K" and is designed so that the oil cup may be always tapped in vertically. This

cule girders forming the opening span of the trunnion bascule bridge at this crossing, which is at the site of the King's Ferry, and carries the highway and railroad connecting the Island of Sheppy with the mainland. This line forms the important connection for fast mail trains with the Con-

K. C. B., who, after careful investigation, advised the construction of a Scherzer rolling lift bridge in place of the existing trunnion bascule bridge, as the former would most readily meet the conditions to be observed both during and after reconstruction, viz., that neither the traffic over the bridge, either by highway or rail, or the headways or waterways of all navigable channels



Drifting Valve Quadrant.

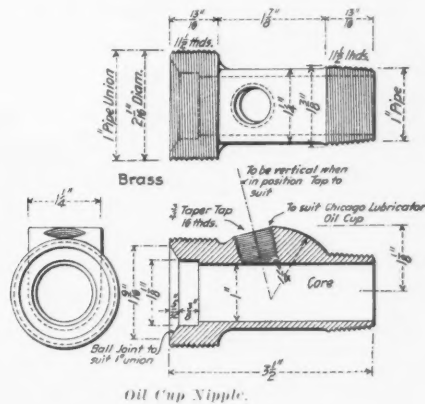
A New Locomotive Drifting Valve.

cup may also be used for introducing graphite to new cylinders or coal oil for cleaning compound cylinders or others.

This drifting valve and attachment is also used by other roads besides the Wabash. We are indebted to Mr. J. B. Barnes, Superintendent of Motive Power and Machinery, for the details of the above description.

tinient, and also forms the connection with the Admiralty Works at Sheerness. The navigable channel being closed to vessels with fixed masts, the railroad company made application to Parliament for power to build a new bridge in the same locality, but failing to obtain the desired authority, it became necessary to fall back upon the original act and to rebuild the movable bridge

under the bridge, were to be interfered with in any way. Acting under the advice of Sir Benjamin Baker and of Mr. P. C. Tempest, Chief Engineer of the railroad, the directors gave the work of rebuilding to the firm of Sir William Arrol & Company. The Scherzer Rolling Lift Bridge Company, Chicago, furnished the detail plans and specifications for the bascule bridge, the entire work being



Oil Cup Nipple.

under the charge of Sir Benjamin Baker, K. C. B. as Consulting Engineer.

The Scherzer bridge consists of a single-leaf, through truss span. It was erected complete in the upright position without interfering with either railroad, highway or water traffic, following the plan used in many instances in the United States with this type of bridge where it was necessary to maintain existing railroad traffic without building a temporary bridge, or shifting tracks or traffic. Upon completion of the new bridge, the old trunnion bridge was floated out on scows and the new bridge immediately closed to receive the railroad and highway traffic.

Another Scherzer railroad bridge is now building across the Suir river, Ireland, for the Fishguard Railways & Harbours Company, a new line nearing completion, forming a direct and rapid connection between Queenstown and the south of Ireland, and the London & South Western Railway, of England. An artistic Scherzer highway bridge is also being built to form the movable portion of a long bridge connecting Barrow-in-Furness with Walney Island, England.

The detail plans and specifications for these bridges were prepared and furnished by The Scherzer Rolling Lift Bridge Company to Sir Benjamin Baker, who is Consulting Engineer for all of the work mentioned.

The High and Low Pressure Retaining Valve.

The great value of the pressure retaining valve in the safe handling of trains on heavy grades has been demonstrated long since, and has become better and better appreciated year by year. The growing severity of modern conditions, as a result of which loads of 73 tons per brake are frequently encountered, has brought about two methods for increasing the certainty of controlling heavily loaded trains, one by raising the train-pipe and main-reservoir pressures, giving a correspondingly

higher brake-cylinder pressure, the other by the employment of a special pressure-retaining valve which will hold higher pressures than that now held by the standard retaining valve, which is designed to maintain a brake-cylinder pressure of 15 lbs. while the auxiliary reservoirs are being recharged. Ordinarily this pressure is sufficient, but under extreme conditions it has proved de-

the intermediate position marked "H.P." (Fig. 3), the eccentric lug does not touch the pin and consequently the outside weight rests upon the top of the inner one and the air-pressure must raise both weights before it can escape to the atmosphere. When the handle is placed vertically downward, the air passes directly to the atmosphere and the retaining valve is cut out. The exhaust

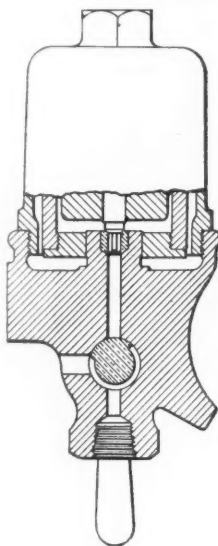


Fig. 1.

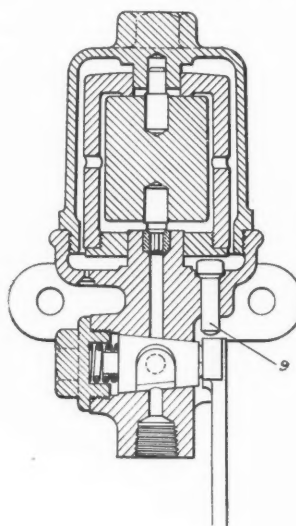


Fig. 2.

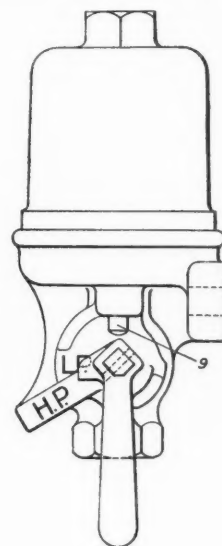


Fig. 3.

High and Low Pressure Retaining Valve.

sirable to have the power of increasing the amount of pressure retained in the brake-cylinders during the recharge to 50 lbs., and this demand is fully met by the new Westinghouse "high-and-low-pressure" retaining valve.

This new retaining valve is similar to the standard type in general design but modified as shown in Figs. 1, 2 and 3. The main difference consists in the addition of a cylindrical weight which surrounds the usual weight and is lifted by it whenever the pin 9 is down. When the handle is placed in the horizontal position an eccentric lug at its inner end raises the pin 9, which lifts the outside weight to the top of its movement; and then the inner weight alone retains the pressure. If the handle is placed in

and low-pressure positions of this retaining-valve handle are similar to those of the standard retaining valve, so that when cars equipped with this valve are running in localities free from heavy grades where the trainmen may not be familiar with this new type but are familiar with the standard valve, they cannot by mistake place the handle in the high-pressure position. Also the letters "h.p." and "l.p." are cast on the body to assist in indicating the positions of the valve handle.

In the development of this device a prominent railroad made some valuable tests with a view of determining what is actually required to hold heavy trains under perfect control when descending unusually heavy grades. In these tests the experimenters used higher air-pressures, special pressure retaining valves, the water brake on the locomotive, and the Westinghouse combined automatic and straight air-brake equipment on the locomotive. The results indicate that to suitably control such trains the minimum train pipe and auxiliary reservoir pressures should not fall below 70 lbs.; this is needed in order to give sufficient reserve braking

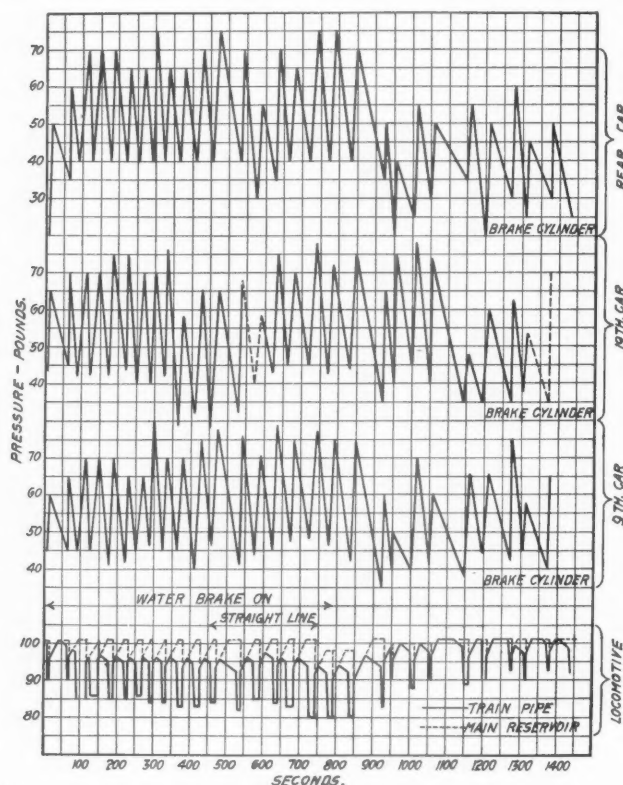


Fig. 4.

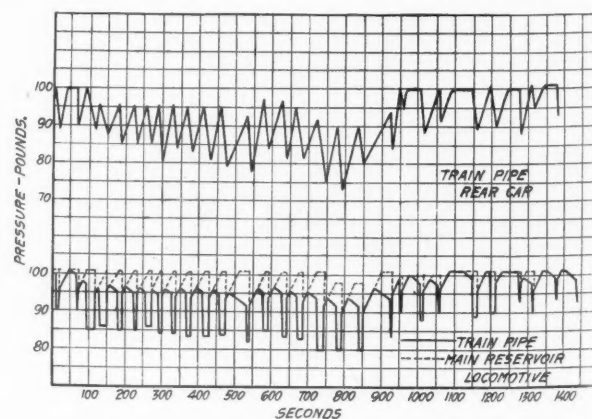


Fig. 5.

power to stop the train in cases of emergency on a heavy grade. This at once demands an increase in air pressure throughout the system, since with the ordinary standards the maximum train-pipe pressure is 70 lbs. This change alone was found insufficient to control the trains and a special retaining valve was applied; this to increase the minimum cylinder pressure to such a point that the average retarding effect would be sufficiently high to place the train under certain control. The most important part of the tests, therefore, related to this feature. The new valve is proportioned to retain a cylinder pressure of 25 lbs., for use on grades of 2 per cent. or less, and 50 lbs. for grades of 4 per cent.

Some results of these tests are shown in Figs. 4 and 5. The train was made up of 26 steel cars having a light weight of about 40,000 lbs. each and a capacity of 100,000 lbs. each. The total light weight of the cars in the train was 520 tons and the total load was 624 tons. The lightest load in any of the cars was 52,000 lbs., while the heaviest load was 131,827 lbs. The locomotive was equipped with two standard 9½-in. pumps, and it had the water brake and the combined automatic and straight air-brake, besides the regular Westinghouse automatic equipment. The main reservoir capacity was 66,600 cu. in. The grade on which the tests were made is 4½ miles long and descends at the rate of 200 ft. to the mile. Nearly in the middle of this grade is a long tangent called the "straight line" which is a particular difficult place to control a train. In the tests from which figures 4 and 5 were taken the combined automatic and straight air-brake apparatus was not used, but the water brake was in use until just after the train left the "straight line."

Fig. 4 represents graphically the changes in train-pipe and main-reservoir pressures on the locomotive and on the brake cylinders in the ninth, 19th and 26th cars, whereas Fig. 5 indicates the change in train-pipe pressure at the rear end of the train produced by each change in the train-pipe pressure on the locomotive. In both these figures the horizontal dimensions represent time in seconds from the start at the top of the grade while the vertical dimensions refer to pressures in pounds per square inch. The pressure-retaining valve was in all cases placed in the 25-lb. position, and it was found that under these conditions the train was in perfect control at all times.

The average cylinder pressures for the whole train were as follows:

	Max- imum.	Min- imum.	Average.
9th car	69.4	43.0	56.2
19th "	65.5	39.0	53.75
Rear "	62.0	34.5	48.25
Whole train	66.6	38.8	53.7
Av'g auxiliary reser- voir pressure for rear car	98.6	85.0	91.8

The entire run occupied 24 minutes, the brakes being on 6 minutes and 34 seconds and off 17 minutes and 26 seconds. The average length of brake application was 13.4 seconds and average time of release was 35.5 seconds. Consequently the brake was applied 27.4 per cent. of the time. The greatest length of time that the brake was applied at any one time was 25 seconds, and greatest length of time of release at any one time was 88 seconds.

From Fig. 4 it will be seen that the pumps were able to restore main reservoir pressure between each two applications in nearly every case, and in many cases ceased to operate for a considerable length of time.

From the above figures the benefit derived from this retaining valve is at once apparent. The hand-brakes were not needed at any time and the air-pressures throughout the entire system were continually kept up so that ample reserve was available for an

emergency stop. On many railroads the use of hand-brakes in conjunction with the air-brake is often resorted to, but such practice is dangerous. A brakeman with a "pick handle" can set up the hand-brakes so that the brake-shoe pressure is greater than that due to the air-brake application. If then an application of air-brakes is added on top of the hand-brake, skidding of wheels is almost sure to follow.

The new valve is somewhat larger and a little heavier than the standard type. The officers of the railroad on which the trials above described were made have expressed themselves as perfectly satisfied with the operation of the valve and as prepared to adopt it.

Train Accidents in the United States in February.¹

rc, 1st, Chicago, Rock Island & Pacific, Rodman, Iowa, a freight train standing at the station was run into at the rear by a following freight, and the car of Superintendent Brown, attached to the rear of the standing train, was wrecked, together with the caboose. Superintendent Brown, Division Engineer Martin and several trainmen were injured.

xc, 1st, 4 a.m., Southern Railway, McDonough, Ga., freight train No. 83 ran over a misplaced switch and into the head of freight train No. 54 standing on a side track, wrecking both engines and several cars. The engineman and fireman of the standing train were killed.

xc, 1st, Philadelphia & Reading, Philadelphia, Pa., a passenger train collided with some coal cars near the terminal station and one car fell off the elevated structure to the ground, 20 ft. below; two employees injured.

*rc, 2d, Great Northern, Milton, N. D., a local freight train which had stopped to do some switching was run into at the rear by a through freight, and one engine, one caboose and four cars were wrecked. The caboose took fire and was burnt up. One brakeman was killed and three other trainmen were injured.

†unx, 3d, 5.15 p.m., Cincinnati, Hamilton & Dayton, Belmont, Ohio, passenger train No. 4 was derailed while running at about 50 miles an hour on a straight line, the rear car being the first to leave the track. The cars were electrically lighted and the lights remained burning after the derailment. One passenger was killed and 10 passengers and one trainman were injured.

unx, 3d, Northern Pacific, Merrill, Mont., a freight train was derailed and eight cars were wrecked; the fireman was injured.

rc, 4th, New York, New Haven & Hartford, Manchester Bridge, N. Y., a westbound freight train which had broken in two was run into at the rear by a following freight, wrecking the caboose. One fireman was killed and two brakemen were injured, one of them fatally.

bc, 4th, Delaware & Hudson, Plattsburgh, N. Y., butting collision between a passenger train and a freight train, due to a misplaced switch. Nine passengers were injured.

o, 4th, 1 a.m., New York Central & Hudson River, Whitesboro, N. Y., the locomotive of westbound passenger train No. 23 was wrecked by the explosion of its boiler and the engineman and fireman were killed. The

¹Accidents in which injuries are few or slight and the money loss is apparently small, will as a rule be omitted from this list. The official accident record published by the Interstate Commerce Commission quarterly is regularly reprinted in *The Railroad Gazette*. The classification of the accidents in the present list is indicated by the use of the following

ABBREVIATIONS.

rc	Rear collisions.
bc	Butting collisions.
xc	Miscellaneous collisions.
dr	Deraillments; defects of roadway.
eq	Deraillments; defect of equipment.
dn	Deraillments; negligence in operating.
unf	Deraillments; unforeseen obstruction.
unx	Deraillments; unexplained.
o	Miscellaneous accidents.

An asterisk at the beginning of a paragraph indicates a wreck wholly or partly destroyed by fire; a dagger indicates an accident causing the death of one or more passengers.

explosion occurred at the moment when the engine was passing eastbound passenger train No. 30, and, either by the force of the explosion or by parts of the wreck, one or more cars of the eastbound train were forced off the track and the whole of them were derailed and ditched, some of them being thrown over a fence, lodging in the field outside. Thirty-three passengers in the eastbound train were injured. This accident was reported in the *Railroad Gazette* of Feb. 17. xc, 4th, 8 p.m., New York Central & Hudson River, North Tonawanda, N. Y., the baggage car of passenger train No. 473 was knocked off the track by a motor car drawing freight cars on an electric railroad, crossing the N. Y. C. The electric motor was knocked against a signal tower and overturned it.

dr, 4th, Baltimore & Ohio, Dennison, Ohio, a freight train was derailed by a broken rail and several cars fell against a freight car standing on the side track. Two men at work in or near the standing car were killed and a third was injured.

rc, 4th, 10 p.m., Boston & Albany Niverville, N. Y., a westbound local freight standing at the station was run into at the rear by a following through freight, and the whole of the local train was wrecked. The caboose and the nine cars of the train were crushed and the tender of its locomotive was thrown crosswise of the track. The engine of the through freight was not derailed. It is said that the runner of this engine was asleep.

rc, 5th, Chicago, Rock Island & Pacific, Des Moines, Iowa, a freight train was run into at the rear by a following freight and the engine and caboose were wrecked. The conductor and one driver were injured.

xc, 6th, Adrian, Mich., a passenger train of the Lake Shore & Michigan Southern ran into a freight of the Wabash, at the crossing of the two roads, wrecking the engine of the Lake Shore train and killing its engineman and fireman.

†unf, 7th, El Paso, Northeastern, Carri-zozo, N. M., a passenger train was derailed by sand which had been washed on the track, and the passenger cars were overturned. Twelve passengers were injured, one of them fatally.

xc, 7th, 2 a. m., Chicago, Rock Island & Pacific, Geneseo, Ill., a westbound freight train standing on the eastbound track was run into in front by eastbound passenger train No. 24, wrecking both engines and the mail and express cars. Eight persons were slightly injured.

rc, 9th, 2 a.m., Iowa Central, New Sharon, Iowa, a freight train standing at a water tank was run into at the rear by a following freight and the caboose and 12 cars were wrecked. The conductor and one brakeman were killed.

xc, 9th, Southern Railway, Columbia, S. C., southbound passenger train No. 33 collided with a switching engine near the station, wrecking both engines and the mail car. Ten passengers and four dining car employees were injured, most of them slightly.

dr, 9th, Chicago, Milwaukee & St. Paul, Melbourne, Iowa, westbound passenger train No. 1, drawn by two engines, was derailed by a broken rail. The derailment occurred about 300 ft. east of a bridge 149 ft. long and 20 ft. high. The leading engine did not leave the track, but the second engine passed over the bridge with the engine truck and one tender truck off the rails, thus damaging the bridge so that the following cars fell through; mail car, baggage car, coach, chair car and four sleepers. One employee was killed, and one express messenger, three mail clerks and 26 passengers injured.

*rc, 10th, Wabash road, Delphi, Ind., eastbound passenger train No. 6 ran over a misplaced switch and into the rear of a freight train standing on the side track, badly damaging the engine and caboose, and the caboose took fire and was burnt up. The conductor of the freight was killed and the engineman of the passenger was fatally injured.

unf, 11th, Mobile & Ohio, De Soto, Miss., a freight train was derailed at a washout and the engine and 12 cars were ditched, the engine being overturned. The engineman

was killed and the fireman and one trainman were injured.

unf, 12th, Missouri, Kansas & Texas, Moran, Kan., passenger train No. 21 was derailed by ice which had formed on the track at a water tank, and one of the two engines drawing the train, together with two cars, was wrecked. One engineman was killed and the other was injured.

unx, 12th, Chicago, Burlington & Quincy, Prescott, Iowa, a passenger train drawn by two engines was derailed and the engines and baggage car were ditched. One engineman was killed and the other engineman and both firemen were injured.

rc, 13th, Boston & Maine, Gilbertville, Mass., a local freight train standing at the station was run into at the rear by a following freight, and the engine, caboose and one freight car were badly damaged. A brakeman was killed.

bc, 13th, Lake Erie & Western, Plymouth, Ind., butting collision between local freight train No. 76 and a work train, injuring two trainmen and 15 laborers. An operator delivered to one of the trains an order in which the name of a meeting point was given wrong.

bc, 13th, 11 p.m., Southern Railway, Easley, S. C., butting collision between freight trains No. 71 and No. 74, making a bad wreck. Two trainmen were killed and three were injured.

xc, 13th, Willow Creek, Ind., a westbound freight train of the Baltimore & Ohio ran into a wrecking train of the Michigan Central, at the crossing of the two roads; five men of the wrecking crew were seriously injured and 20 others slightly.

rc, 14th, Pere Marquette, Holland, Mich., a train consisting of an engine and one car, the car being occupied by workmen going to release a work train which had become stuck in the snow, ran into the stalled work train, crushing the caboose at its rear end. The 16 employees connected with the stalled train were in a passenger car next ahead of the caboose and five of them were seriously scalded or bruised.

xc, 14th, Missouri Pacific, Gypsum City, Kan., a freight train with two engines, which was stalled in a snowdrift, was run into by a work train sent to its relief, and all of the four engines were badly damaged. Soon after the collision a following freight train ran into the rear of the relief train, making a second bad wreck; 12 employees were injured.

dr, 14th, 1 a.m., Hocking Valley road, Rising Sun, Ohio, a northbound passenger train was derailed by a broken rail, and the baggage car and three passenger cars were overturned. Two passengers were injured.

dr, 16th, Southern Railway, Fairforest, S. C., express train No. 37 was derailed at a misplaced or defective switch, and the engine and first five cars were wrecked. The engineman, fireman and five mail clerks were injured.

eq, 16th, Lake Champlain & Moriah, Port Henry, N. Y., a train consisting of an engine and 7 cars, heavily loaded with iron ore, became uncontrollable on a 4 per cent. grade by reason, it is said, of the inability of the engineman to shut the throttle valve, and ran at very high speed to a "switch-back," where the track comes to an end, about two miles beyond the foot of the grade. The end of the track is on an embankment, so that the train flew out into the air; and the engine is said to have first struck the ground at a point 340 ft. beyond the end of the track.

bc, 18th, Pennsylvania road, Norristown, Pa., butting collision between a passenger train and a freight; both firemen injured.

xc, 19th, 9 p.m., Gulf, Colorado & Santa Fe, Cedar Hill, Texas, passenger train No. 65 ran over a misplaced switch and into the head of a freight train standing on the side track, wrecking the engines and two coal cars. Four trainmen were injured.

unf, 19th, 10 p.m., Texas Southern, Gilmer, Tex., passenger train No. 54 broke through a trestle bridge which had been weakened by a flood, and the engine fell into Twin Creek. The engineman and fireman were fatally injured.

unx, 20th, Southern Railway, Front Royal,

Va., a passenger train was derailed and fell down a bank. The engineman and fireman were fatally injured and two passengers less seriously.

tdr, 20th, Chicago, Rock Island & Pacific, Wiota, Iowa, a passenger train was derailed by spreading of rails and three passenger cars were ditched. Two passengers were killed and 12 injured.

teq, 20th, Erie road, Fairlawn, N. J., a passenger train was derailed by the breakage of a brake beam or brake shoe, and several cars were ditched. One passenger was killed and 44 were injured.

unx, 20th, Cincinnati, Hamilton & Dayton, Swanders, Ohio, passenger train No. 8 was derailed and two passenger cars were overturned; 12 passengers were injured.

xc, 21st, Northern Pacific, Plains, Mont., a passenger train ran into the caboose of a freight train which was entering a side track but had not cleared the main line, wrecking the caboose and one car. Two passengers and two trainmen in the caboose were injured, one of the trainmen fatally.

xc, 22d, 5 a.m., Pennsylvania road, Tyrone, Pa., passenger train No. 29 collided with an empty engine, wrecking both engines and one car. The empty engine was running backward on the main track, the engineman believing that he was on a side track; three trainmen and one passenger injured.

unx, 22d, Southern Pacific, Sandy Forks, Tex., westbound passenger train No. 9 was derailed and seven cars were ditched, three of them being overturned. One passenger, two mail clerks and one trespasser were injured. It is said that the tender of the second of the two engines drawing the train was the first vehicle to leave the track.

xc, 23d, Chicago, Milwaukee & St. Paul, Rio, Wis., collision between passenger train No. 2 and fast mail train No. 55; several persons injured.

bc, 23d, Pennsylvania road, Fuller, Pa., butting collision between a passenger train and a freight; 10 passengers and four trainmen injured. It is said that the collision was due to a misunderstanding of orders.

rc, 24th, Philadelphia & Reading, Parkland, Pa., an eastbound express train ran over a misplaced switch and into the rear of a freight train standing on the side track, wrecking the caboose and three platform cars. The engineman and fireman were injured.

bc, 24th, Louisville & Nashville, Hazel Patch, Ky., butting collision between freight train No. 27 and freight train No. 38, wrecking both engines and several cars. Four trainmen were injured.

bc, 25th, Baltimore & Ohio, Fair Point, Ohio, butting collision of freight trains, wrecking both engines and many cars. One trainman was killed and two were injured.

xc, 28th, Pittsburgh, Cincinnati, Chicago & St. Louis, Chicago, Ill., a southbound passenger train of the Chicago, Milwaukee & St. Paul collided with a work train; one employee killed and four injured.

General Passenger Agents' Fiftieth Anniversary.

At Pittsburg, Pa., March 13, the American Association of General Passenger Agents held a meeting in celebration of the fiftieth anniversary of the organization of the association, which took place in that city March 13, 1855. The meeting this year was at the Hotel Schenley, the site of which in 1855 was so far from the city as to be classed as an unknown country. Mr. J. A. Brown, of Columbus, Ohio, is the only man now living who was present at the meeting of 1855.

President F. E. Boothby (Maine Central), of Portland, Me., made an interesting address, in which he said, in part:

"In 1855 the railway service of this country had been in operation only about 20 years, and only 11 years had elapsed since the first telegraph line was operated between Baltimore and Washington; the railway mileage of the United States was but 18,374, and there was no line reaching farther west than Jefferson City. On a map issued the

following year for the Appleton Guide, that point was still the western limit. In 1857 mail communication with New Orleans had not been established, the southern terminus being Montgomery. Memphis might be reached from the Atlantic coast via Atlanta. The roads projected toward Omaha had just crossed the Mississippi river at Rock Island, Burlington and Dubuque. The nearest rail approach to St. Paul was Prairie du Chien and Portage City. There was no railroad into Washington from the south, Alexandria being the nearest rail point in that direction, and connection for Richmond was made by steamboat to Acquia Creek.

"The population of the United States was then 23,191,876; the city of Pittsburg, 46,601; New York, 515,547; Philadelphia, 408,762; Boston 136,881; Chicago, 29,963, and St. Louis, 77,860, and there were but 32 states. The Pullman car was not introduced until 1864.

"In 1883 the adoption of standard time was brought about by efforts of that good friend to us all, William Frederic Allen. In 1885 occurred the opening of the Canadian Pacific Railway.

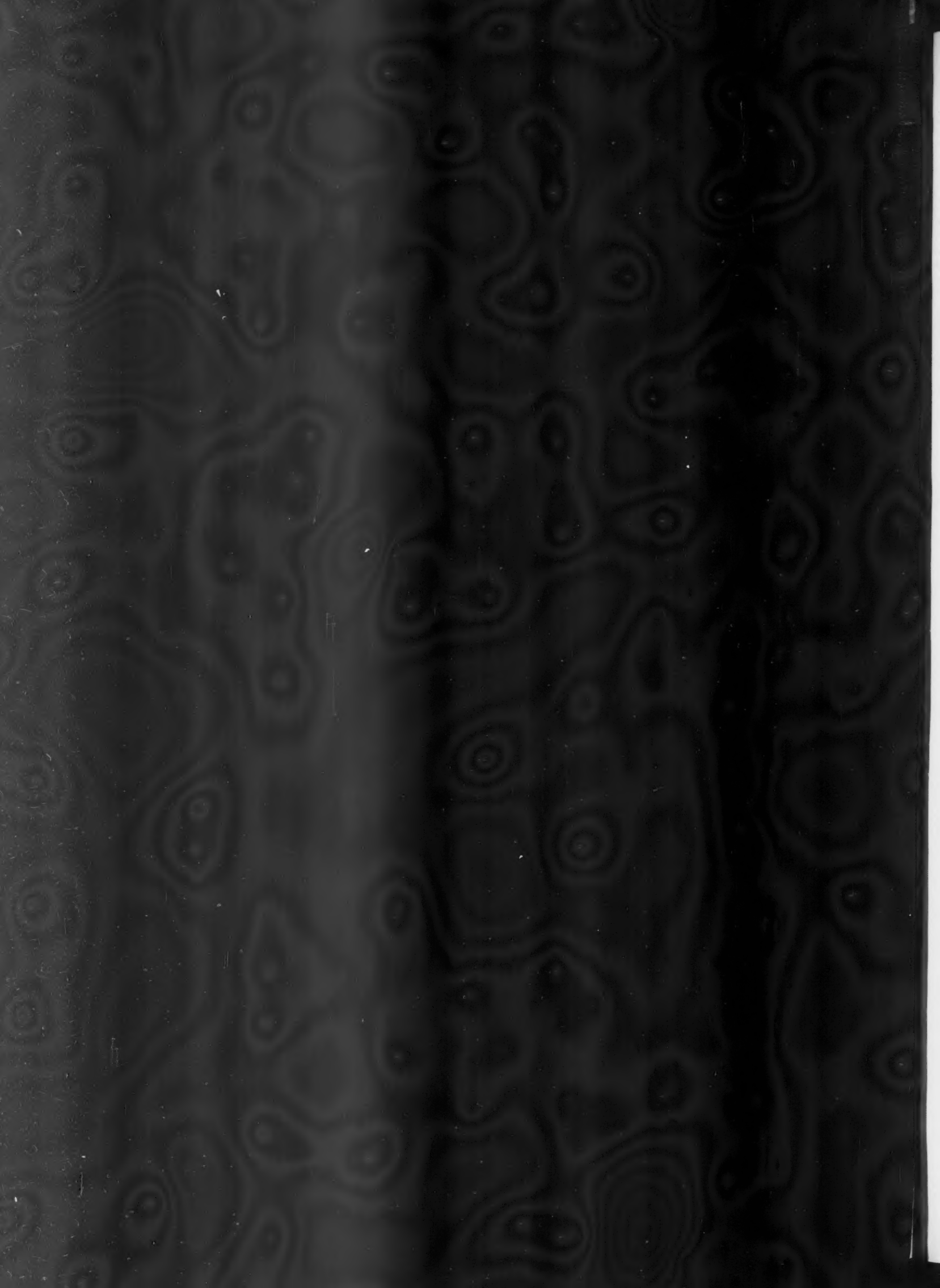
"Of the 159 accredited members in 1884 23 only are to-day members of the association. They are Allaire, Anderson, Boothby, Connor, Danley, Eustis, Flanders, Ford, Fuller, Hibbard, Hooper, Horner, Hanson, A. H.; Kendall, Lockwood, Morse, F. W.; Nimmo, Ruggles, Smith, Geo. H.; Smith, A. J.; Teasdale, Townsend and Wood, or 24 counting Fee, who is not a member, but is entitled to membership.

"At a meeting of the association held some years after at the Hotel Vendome [Boston?], at the hour at which it should have been called together not a soul was in the meeting room other than the president and secretary. The secretary, then going out into the office to see what was the matter was not fortunate enough to find any of the members there and pursuing his investigations found the whole party out on the sidewalk waiting to see Lillian Russell mount her bicycle.

"The index of the Travelers' Official Guide for 1889 shows 920 transportation companies, while to-day it shows the number as 1,664. This includes steamer lines as well as railroads. As an illustration of consolidation the list of old and new names of roads as shown in the guide gives 3,534 original roads, which have now been merged into 486 systems. One hundred and twenty-one original lines now constitute the Pennsylvania System, 99 the Boston & Maine, 108 the New York, New Haven & Hartford, 95 the New York Central & Hudson River, 97 the Baltimore & Ohio, 95 the Southern, 71 the Atlantic Coast Line, 78 the Santa Fe, 90 the Chicago, Milwaukee & St. Paul, 91 the Chicago, Burlington & Quincy, 71 the Chicago & North Western, 85 the Illinois Central; and so on.

"Freight cannot talk, but passengers can. Next to the president and the general manager the passenger traffic manager or general passenger agent is or should be the best known official of any line, and if there is any one of us who is not working with this end in view he should at once change his tactics."

The Indian Government is considering a plan to designate certain types of passenger cars on Indian railroads which can be easily adapted for use as ambulance cars in times of emergency by attaching to the side of each car an iron plate bearing a large red cross. One scheme which has been suggested is to have a reversible plate bearing on one side a small cross for the purpose of distinguishing these cars in ordinary service and on the other side a large and prominent red cross to be placed outward when the car is in use as an ambulance.



GENERAL NEWS SECTION

NOTES.

The Grand Trunk Railway of Canada is extending the use of telephones on telegraph wires and, according to a Toronto despatch, has in consequence of this change dismissed 20 or 30 telegraph operators.

A press despatch from San Francisco says that the Santa Fe road has ordered a steamer for use on the Sacramento river as a fruit carrier, with a view to helping the trans-continental fruit traffic of the railroad.

Five men were arrested in New York City last week charged with printing and selling spurious passes over the New York Central. The signatures of Chauncey M. Depew and of his secretary are said to have been forged on the passes.

The Chicago & North Western is to send a "good-roads train" through Iowa for the purpose of informing and instructing the farmers by means of lectures and literature. It will start on April 10 and a tour of 18 days has been laid out.

The Legislature of Oklahoma Territory has passed a severe law regulating demurrage charges on freight cars. Every agent must furnish cars to all shippers on application, and violation of the law subjects the offender to fine and costs.

Members of the Brotherhood of Locomotive Engineers have proposed to the Pennsylvania Railroad that they be allowed to make small contributions to the pension fund of the company and thus make it possible to retire employees at 60 instead of at 65, which is the present minimum age limit.

The police officers of the Erie Railroad in a space of 10 days have arrested over 200 coal stealers and other trespassers. Twenty-two men were fined or imprisoned at one town, and 12 at another (Youngstown). These 12 were fined \$12 and costs each, and also were required to pay \$15 each for coal which they had stolen.

A Chicago paper says that officers of the Burlington road express satisfaction with their experiment, begun several months ago, of reducing to a low figure the single-trip passenger fares between Chicago and suburban stations for the purpose of stopping the outside speculative traffic in book tickets, which has become common.

A coroner's jury at Pittsburg has investigated the disastrous collision which occurred near Clifton, Pa., March 3, and recommends that the engineman, Andrew Long, be held for manslaughter; and also that, for failure to have the wrecked train properly equipped with fire extinguishers, the master mechanic, the train despatcher and the station agent at Cleveland be censured.

Reports from Philadelphia are to the effect that the congestion of freight on the Pennsylvania Railroad, which has been constant since January, has just been cleared up. The movement of cars over the Middle Division (both ways) is now from 6,200 to 6,700 daily; much heavier than in any former year at this season.

It is reported from New Haven that the dispute between the enginemen's brotherhood and that of the firemen, which a few

weeks ago was made by the firemen the pretext for threatening a strike, has been settled. Hereafter "an engineer who is a member of the Firemen's Brotherhood, or, in fact, any engineer, will be allowed to choose two disinterested engineers employed by the company to accompany and speak for him before boards of investigation." Heretofore in such a case he could take only one.

The oil pipe line laid by the Standard Oil Company from the oil fields of Kansas to Kansas City has been declared a common carrier by the legislature of the state, with a view to compelling the company to convey oil for independent producers, and to making the rates subject to the control of the state officials. According to a Kansas City correspondent of *Public Opinion*, this law was passed mainly because the railroad rate for the transportation of oil in cars was raised from \$55 a car to \$97 a car soon after the pipe line had been completed. This action of the legislature is a part of the general crusade against the Standard Oil Company which was recently begun in Kansas, and which includes the establishment of a state refinery, the appointment of a state inspector, the passage of a law raising the fire test of refined oil from 110 deg. to 130 deg., and a law forbidding any person or persons, or corporation, to sell goods at different prices in different parts of the state on the same day.

A New Armored Cruiser.

The armored cruiser Washington was launched on March 18 from the yards of the New York Shipbuilding Co. at Camden, N. J. The Washington is a sister ship of the Tennessee, and has a displacement of 14,500 tons; her engines are of 23,000 i.h.p., and her contract speed is 22 knots an hour.

An Irrigation Contract.

After a competition in which 21 bids were submitted, contract has been let by the Secretary of the Interior to J. M. O'Rourke, of Galveston, Texas, for the construction of the large dam in Salt River Valley, Arizona, which is to be built under the national irrigation act. The dam is to be known as the Roosevelt dam, and will be 225 ft. high and 200 ft. thick at its base. The water dammed will be sufficient to irrigate about 350,000 acres and also to supply water-power to a large number of places in the territory. The dam will cost \$1,100,000 and must be completed within two years.

Cost of Electric Street Railways in England.

In a paper read at a recent meeting of the Tramways and Light Railways Association the cost of building electric street railways in England per mile, single line, was stated to range from \$19,467 to \$29,209. The proportionate costs of the various kinds of work were figured as follows: For rails and fastenings, 22 per cent.; special work, 10 per cent.; paving material, 30 per cent.; cement, sand, and broken stone, 14 per cent.; labor, 15 per cent.; bonds, cartage, and miscellaneous items, 9 per cent.—*U. S. Consular Reports*.

The Arnold Company.

Announcement is made of the change of name of the Arnold Electric Power Station Company, of Chicago, to "The Arnold Company." This company was organized in 1886 by its President, Mr. Bion J. Arnold, pri-

marily to build electric power plants, but the scope of its work has gradually increased until it now includes nearly all that pertains to electrical, civil and mechanical engineering, in both a consulting engineering and a constructing capacity. In the latter connection the company maintains a complete construction organization capable of building the work it designs. The growing business of the company has necessitated an enlargement of its quarters in the Marquette building in order to increase the facilities of the drafting and engineering departments. The broadened scope of its work now embraces complete interurban railways, electrification of steam roads, shops and shop equipment, hydro-electric and transmission plants, investigations and reports, tests and inspection of electric properties, operating and modernizing of industrial plants. Under the first of the foregoing heads, the company has been connected with the building of a large number of important and well-known interurban lines in the central west. Two of these lines are single-phase alternating current roads using Mr. B. J. Arnold's well-known system, which was described in the *Railroad Gazette* Jan. 1, 1904. The company's list of electric power station installations includes large industrial concerns, railroads, and office and public buildings in various cities. It has had charge of equipment for light, heat, power, air and steam of a number of the large new railroad shops built in the past few years, including the New York Central, Union Pacific, Denver & Rio Grande, Pere Marquette, St. Louis, Iron Mountain & Southern, Oregon Short Line, Chicago & Eastern Illinois, Chicago Great Western and Wisconsin Central. An interesting hydro-electric plant was designed and is now being built by the company for the Spring River Power Company. It is of 3,000 k.w. capacity and will have a 33,000-volt transmission line from the water power plant at Lowell, Kan., to the lead and zinc mines in the vicinity of Joplin, Mo. The Arnold Company is a pioneer in high-tension transmission work for electric railways, having taken a contract for the first rotary converter system with a steam station in 1897. The organization of the company continues unchanged, Bion J. Arnold being President; W. L. Arnold, Vice-President; R. G. Arnold, Treasurer; Geo. A. Damon, Managing Engineer. Mr. B. J. Arnold is a Past-President of the American Institute of Electrical Engineers. He was retained by the New York Central as Consulting Engineer in the electrification of its lines entering New York City. Two years ago, by agreement with the City of Chicago, he submitted an exhaustive report on the whole matter of local transportation within the limits of the city, covering engineering and operating matters. His report was briefly reviewed in these columns Jan. 9, 1903. The Arnold Company issues bulletins from time to time describing the technical features of various installations. These bulletins contain considerable engineering data and are therefore of value to engineers and others. A blue-print book containing considerable data of interest to the mechanical officers of steam roads has been compiled and distributed among the friends of The Arnold Company. A set of blue-print maps showing the growth of the network of interurban electric roads in the western states and indicating the relative sizes of the cities, as well as lines under construction and pro-

posed, are kept up to date and are furnished free to electric railroad officers.

McGrath Pneumatic Turntable Motor.

The engravings show the McGrath pneumatic turntable motor. Its component parts comprise a motor box, frame, gear and friction wheels, and hinge bracket. The motor box is bolted to the side of the frame (Fig. 1), and between the shears of the frame are the machine-cut gear wheel and flanged frictional wheel, 25 in. in diameter. These are bolted together, bushed with a bronze bushing, and revolve on a 2-in. steel axle. Directly behind these wheels is a cylinder of 10-in. bore. The hinge bracket is bolted to the side of the turntable, and the frame is attached to this by a 2-in. steel pin, which allows the motor frame, etc., to rise and fall with the unevenness of the circle-rail in the pit, and also allows for the tilting of the table. Inside of the motor box are the oscillating brass cylinders, 4 in. x 4½ in. On their crank-shaft, outside of the motor box, is a steel pinion which engages the 25-in. gear wheel.

When the air is admitted to the motor box it also enters the lower part of the 10-in. cylinder in the frame. This forces its piston rod up against the arm of the hinge bracket, and so forces the friction wheel down in contact with the circle-rail in the pit. Both ends of this frame-cylinder are fitted with stuffing boxes. The piston rod extends through the lower end of the cylinder, and to it a brake-shoe is attached, which slides up and down in ways in the frame. When air is admitted to the upper end of the frame-cylinder it forces this brake-shoe against the rail, lifting the friction wheel from contact with the rail and bringing the back of the motor frame against the bracket, which effectually stops the table at any point.

Fig. 2 shows the motor attached to a table, also the position of the platform and of the operating handle. The motor is reversible and under complete control from the operating lever. The lower part of the operating lever rod is connected to a rotary valve which admits air to the motor box, and to the lower part of the 10-in. cylinder. The reversing valve in the motor box is connected with the operating lever and is so arranged that when the latter is on the center, the former is also, and all the ports are closed. This also closes the rotary valve and opens the relief port underneath it, which allows the air to escape from the motor box and from below the piston in the 10-in. frame cylinder. When on the center the operating handle is directly over the rod operating the brake valve. By lifting the handle of the operating lever, which is pivoted in the center, the opposite end presses down the brake-valve rod and opens the valve, admitting air to the top of the 10-in. cylinder and forcing the brake-shoe against the rail. When the handle is lowered, the brake-valve closes and the pressure above the piston in the frame-cylinder is relieved by the air escaping through a relief port in the brake-valve. This arrangement makes it impossible to operate the brake and the motor at the same time.

There may be three independent sources of air supply to the motor: (1) Connected to a shop plant and conveyed through a revolving connection in the center of the table; (2) from the air pump on the engine being operated and coupled either to the hose on the tender or pilot; (3) from an engine standing on the track near the table, and

connected through the revolving connection the same as from the shop plant. The last is convenient in many cases to turn cars or a dead engine when the shop plant is not available. When this plan is used, a circular pipe can be placed around the top of the pit with hose attachments at convenient intervals around the table.

These motors are made by The Draper Manufacturing Co., Port Huron, Mich. Installations have been made for a number of roads, including the Grand Trunk, Baltimore & Ohio, Pere Marquette, Lehigh Valley, Philadelphia & Reading, Long Island, Santa Fe, and Canadian Pacific.

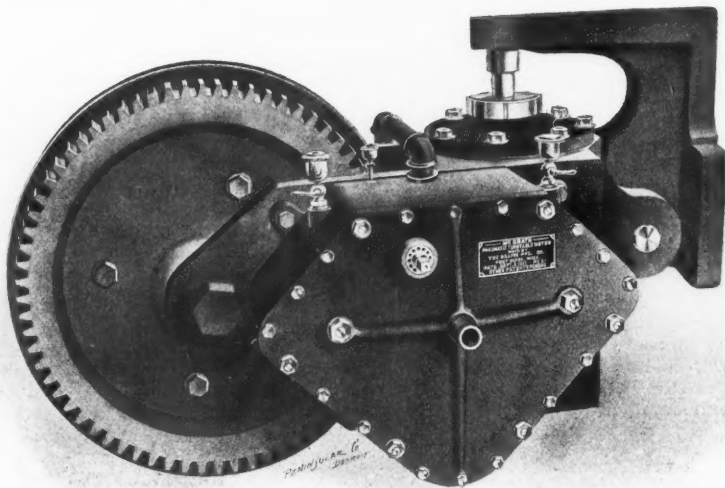
Pneumatic Tool Litigation.

On March 6th the United States Circuit Court of Appeals at Philadelphia handed down an opinion reversing the decision of

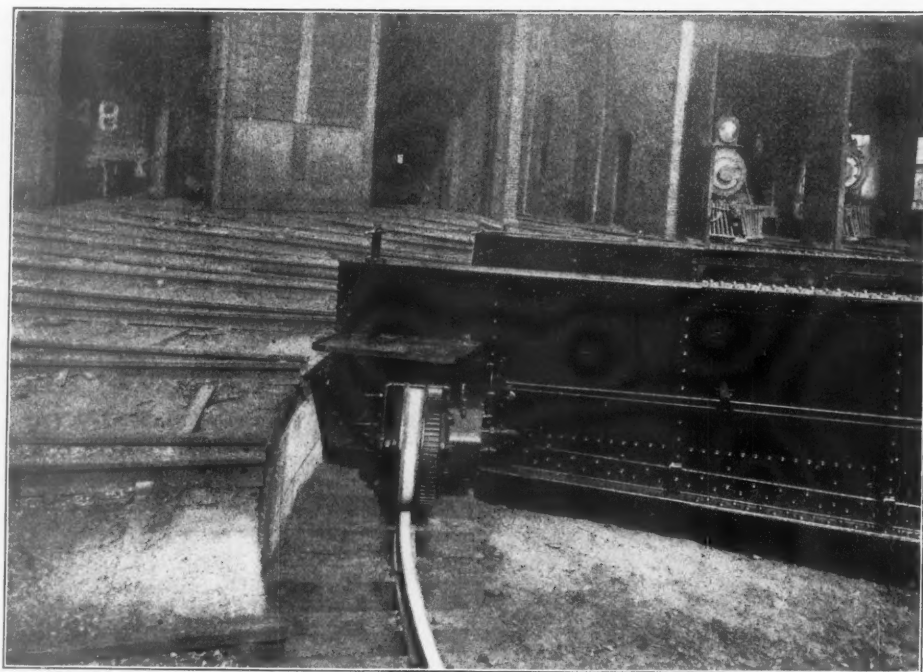
ated by the finger of the workman. Judge Dallas, who delivered the opinion, maintained that inasmuch as the valve of the Cleveland tool is not located in the grasping portion of the handle as required by the claims in suit, but beyond it, in a distinct recess specially fashioned to receive it, the distinction is sufficiently material to sustain the novelty of the device. Hence the decree of the court below, from which the Cleveland Company appealed, was reversed.

Lehigh Valley Terminals.

The Lehigh Valley has completed two flour piers in the "gap" at Communipaw, Jersey City, N. J., each covering half an acre. These piers replace those destroyed by fire last year. There are two water tanks, and a complete pipe system for flooding the piers automatically in case of fire, and a boiler to



The McGrath Pneumatic Turntable Motor.



Showing the McGrath Motor in Position on Turntable.

the lower court in the case of the Chicago Pneumatic Tool Company vs. the Cleveland Pneumatic Tool Company, charging infringement. The lower court had sustained the charge and granted a preliminary injunction. The suit concerned the control of the pressure supply to tools from a valve located in the grasping portion of the handle and oper-

furnish steam for keeping the water from freezing in the tanks in winter. The tanks, pipes and appurtenances cost \$60,000.

The company has broken ground for a new machine shop at Oak Island, near Newark, N. J., where is the large eastbound freight yard. The shop will employ 100 or more men in repairs on the engines that run into

Communipaw. The company also intends erecting a roundhouse and turntable at Oak Island. There is no roundhouse at Communipaw, all waiting engines being obliged to stand out of doors. A third improvement consists of the new cattle shed and pens west of Jersey avenue, Communipaw, N. J. The old pens east of Jersey avenue are connected by a bridge spanning the street. The new sheds cost \$36,000.

New Abattoir at Jersey City.

The Pennsylvania Railroad Company has begun the work of rebuilding the abattoirs leased by the Jersey City Stock Yards Company facing the North river in Jersey City. Last year the entire plant, except the cattle abattoir directly on the water front, was destroyed by fire. The area covers $3\frac{1}{2}$ acres and extends from the Erie grain elevator on the north to Fifth street on the south, and from the North river on the east to Provost street on the west. The present cattle abattoir will be retained and a complete new set of buildings will be erected adjoining and extending westward. The first of these will be a combined hide house, engine house and boiler room 330 x 90 ft.; a rendering house 90 x 90 ft.; a hog abattoir 90 x 120 ft.; a sheep abattoir 90 x 400 ft., and a hog and sheep storage building 90 x 250 ft. All of these buildings will be sheathed with corrugated iron. The estimated cost is \$200,000. P. Sanford Ross, of Jersey City, is the contractor.

Manufacturing and Business.

The Buda Foundry & Manufacturing Co., Chicago, has been given a large order for track supplies for the Panama Canal work. The material is now being shipped.

Mr. E. B. Boye, who has been connected with the Chicago office of Manning, Maxwell & Moore for the past five years, has been appointed manager of the firm's Cleveland office.

Miguel C. Palmer has been appointed General Manager of the Compania Del Ferrocarril, at Matanzas, Cuba, and is asking for all kinds of catalogues and samples from dealers in railroad materials.

W. E. Bryant, Vice-President of the Michigan Lubricator Co., Detroit, Mich., reports an order of 50 additional "Bull's-eye" lubricators from the road mentioned in our issue of March 10th as having ordered 50.

The Long Island R. R. has awarded to the Climax Stock Guard Co., Chicago, the contract for the guards for that portion of the line to be equipped for third-rail electric service. The contract will require 25 car loads of guards.

The bids opened by Dock Commissioner Featherstone on March 13 for the new ferry terminal at St. George, Staten Island, N. Y., were: The Seely-Taylor Co., \$366,200; George B. Stearin, \$469,067; Bernard Rolfe, \$512,413; George W. Roden, \$546,304. The contract has not yet been awarded.

The Riter-Conley Manufacturing Company, of Pittsburg, has been given a contract for 15,000 tons of new structural steel to be used by the New York Central & Hudson River Railroad Company in repairing and replacing many of the bridges on the West Shore. The contract amounts to \$2,000,000.

Allis-Chalmers Company, of Milwaukee, Wis., U. S. A., will be represented hereafter in West Australia by Mr. F. R. Perrot, and in New Zealand by the firm of John Chambers & Son, Ltd. Mr. Perrot's headquarters are at Perth, West Australia, and those of John Chambers & Son, Ltd., are at Auckland.

Under orders from Judge Speer, of the United States District Court, the property of

the Georgia Car & Foundry Co. will be re-sold, as the purchase price at the former sale was inadequate. The inventory of the property gives an estimated valuation of \$85,000, and the price bid at the previous sale was only \$32,500.

At the regular annual meeting of the stockholders of the Apex Equipment Company the following officers and directors were elected: Willard U. Taylor, President; Clifton B. Jordan, Vice-President and Secretary; J. Sterling Drake, Treasurer and General Manager. Mr. M. C. Davis, formerly General Manager, is no longer with the company.

The Duff Manufacturing Company, Pittsburg, Pa., has received another contract for a large quantity of Barrett track jacks for the Government railroads of Russia. This is the third contract from this source within the year received by the Duff Company, and the Barrett jacks have been adopted exclusively by the Russian Government for their railroad work.

An order for four 4,000-k.w., three-phase, 60-cycle, 6,600-volt, alternating current generators, with exciters, has just been placed with the Crocker-Wheeler Company, Ampere, N. J., by the Trustees of the Sanitary District of Chicago. These machines are to be driven by Wellman-Seaver-Morgan horizontal water-wheels, and are to be put in operation at Lockport, Ill., which is at the western end of the Chicago sanitary and ship canal.

The Chicago & North Western Railway Company has placed an order with Allis-Chalmers Company, of Milwaukee, for two Reliance 32 in. x 36 in. belted engines and two 250-k.w. direct-current Bullock generators. These will be installed as two separate units in the power house of the company at Buxton, Iowa, and will be used for driving machinery in the coal mines there, which furnish fuel for some of the western divisions of the road.

The Sullivan Machinery Company, Chicago, has established a branch office at Salt Lake City, Utah, at 128 Keith Building. Mr. John C. Taylor, formerly of the Denver office, is Manager. A full line of Sullivan straight-line air compressors and rock drills with mountings, equipment and duplicate parts will be carried in stock. Inquiries for diamond core drills, heavy hoisting engines, coal cutting machines, and quarrying machinery will receive prompt attention.

Mr. Chas. D. Knight has been appointed Chief Engineer of the American Electric & Controller Company. Mr. Knight was formerly connected with the engineering departments of the General Electric Company, Schenectady; National Electric Company, Milwaukee, and the Cutler-Hammer Manufacturing Company, of the same place. Under his supervision the American Electric & Controller Company will manufacture in addition to the "Rheocrat" a complete line of alternating and direct current controllers, starters, automatic switches, solenoids, etc. Mr. Knight's address will be 12 Dey Street, New York.

The Consolidated Car-Heating Company have received an order from the Southern Pacific Company for 85 consolidated drum equipments, 16 direct steam equipments complete, and 25 locomotive equipments complete with Consolidated type of coupler. This is in addition to the order for 120 car equipments received last month for the Harriman Lines. The Consolidated Company has also received an order from the Wisconsin Central Railway for 13 direct steam equipments for new cars which are now being made. The Consolidated Company has also received numerous large orders for its new $1\frac{1}{2}$ -in. steam couplers.

An organization known as the Progress Club has been formed by the employees of the B. F. Sturtevant Co., Boston, Mass. The object of this club will be the consideration of questions pertaining to engineering and commercial interests, and to increase the mutual acquaintance of the members. Its membership is open to all, high or low, who are in any way associated with the company. A distinct purpose of the club will be to associate in its membership those in the branch houses and local offices, as well as those connected with the plant at Hyde Park.

The J. G. Brill Company, as reported in our Car Building columns, has received an order from the Boston Elevated Railroad for 40 semi-convertible cars. These are to be mounted on its 27-E trucks for high-speed service on suburban surface lines. This truck has a cushioned side swing which at the entrance to curves, draws the car body gently out of the line of its momentum into the new direction without the usual jar and lurch which wrenches the body. A great many of these trucks are in use and it is claimed that they have never been derailed, except in collisions.

Iron and Steel.

The Western Maryland is in the market for 2,300 tons of rails.

The Bethlehem Steel Works, according to reports, will spend between \$2,000,000 and \$3,000,000 in building extensions to its plant.

The Alabama Consolidated Coal & Iron Company is to build a new furnace at Gadsden, Ala., a duplicate of the present plant. It will cost about \$350,000, and will make 200 tons of pig iron a day.

The Chattanooga (Tenn.) Blast Furnace Co., with a capital of \$225,000, has applied for a charter, and will rebuild the old furnace and make improvements to cost about \$100,000. C. B. Buck, of Birmingham, and H. Bond, of Chattanooga, are interested.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies see advertising page 24.)

Canadian Society of Civil Engineers.

A meeting of the Mechanical Section was held March 23, at which a paper by W. H. Laurie, M. Can. Soc.-C. E., on "Gas as a Motive Power, and its Relative Cost," was read by the author.

American Railway Association.

The spring session of this Association will be held at the Waldorf-Astoria, New York City, April 5. Reports will be presented by the committees on Train Rules, on Car Service, on Safety Appliances, on Statistical Inquiry, and on Standard Cipher Code. The annual election of officers, to include a President and a Second Vice-President, will also take place at this meeting.

PERSONAL.

—Mr. George W. Shannon, Secretary and Auditor of the Florence & Cripple Creek, died suddenly on March 17.

—Mr. F. D. Tucker, Division Superintendent of the Chicago, Milwaukee & St. Paul, died at his home in Des Moines, Iowa, on March 9, at the age of 42.

—Mr. F. B. Clarke, until recently General Traffic Manager of the Great Northern, has retired on account of failing health, and the company has granted him a pension equal to his salary.

—Mr. C. F. Annett, formerly Assistant Superintendent of Telegraph of the Illinois

Central, has been appointed Superintendent of Telegraph, Telephones and Electric Lighting for the Isthmian canal, with office at the City of Panama.

—Mr. C. R. Moriarity, who has resigned as Assistant Superintendent of the Chesapeake & Ohio, has been in the service of that company for the past 14 years. Mr. Moriarity is now Manager of the Kanawha Fuel Company at Cincinnati. This company controls the output of about 70 mines in the Kanawha District, and has a yearly capacity of six million tons.

—Mr. Charles A. Kniskern, for many years Assistant General Passenger Agent of the Illinois Central, died in Chicago, on Saturday, March 18, at the age of 52. Mr. Kniskern had been in railroad service for the past 32 years, and his entire service has been on the Illinois Central. He began as an office boy and worked in various clerical positions until the summer of 1891, when he was appointed Assistant General Passenger Agent, which position he held up to the time of his death.

—Mr. C. P. Snow, Assistant Superintendent of the Chesapeake & Ohio at Huntington, W. Va., was born in Dayton, Ohio, in 1872, and began his railroad service as an engine boy in that city for the New York, Pennsylvania & Ohio. The next year he was on the Cleveland, Cincinnati, Chicago & St. Louis as yard clerk, but resigned and went to the Chesapeake & Ohio in a similar capacity, and filled various positions, such as car record clerk, chief clerk and assistant yard master, until 1897, when he was appointed Assistant Trainmaster at Thurmond, W. Va. In 1899 he was made Trainmaster at Lexington, Ky., and in 1904 was transferred to Covington, Ky., as Trainmaster of the Cincinnati Division, which position he has since held.

ELECTIONS AND APPOINTMENTS.

Bangor & Aroostook.—W. K. Hallett, hitherto Assistant Superintendent, has been appointed Superintendent at Bangor and J. B. McMann, hitherto Assistant Superintendent, has been appointed Superintendent at Houston, Me.

Chicago Great Western.—C. P. Stembel, hitherto Superintendent of the Southwest Division, has been appointed Superintendent of the Eastern Division, with headquarters at Dubuque, Ia., succeeding R. W. Edwards, resigned.

Chicago, Rock Island & Pacific.—J. E. Gould, hitherto Master Mechanic of the Cincinnati, Hamilton & Dayton, has been appointed Master Mechanic of the Colorado & Nebraska Division of the C. R. I. & P., with headquarters at Goodland, Kan.

Cincinnati, Hamilton & Dayton.—See Chicago, Rock Island & Pacific.

Cleveland, Cincinnati, Chicago & St. Louis.—E. P. Higgins, hitherto Assistant Auditor, has been appointed Auditor of Disbursements. The position formerly held by Mr. Higgins has been abolished.

Colorado Springs & Cripple Creek.—F. G. Trumbull has been elected President.

Colorado & Southern.—H. F. Lambert has been appointed Assistant General Freight Agent, with office at Cripple Creek, and D. C. MacWatters, Assistant General Passenger Agent, with office at Colorado Springs.

Grand Trunk.—F. L. C. Bond has been appointed Resident Engineer of the Eastern Division, with headquarters at Montreal, P. Q.

Great Northern.—F. I. Whitney, General Passenger Agent, has been appointed Passenger Traffic Manager and W. W. Broughton, General Freight Agent, has been appointed Freight Traffic Manager.

Illinois Central.—A. S. Baldwin, hitherto Engineer of Construction, has been appointed Chief Engineer, succeeding H. U. Wallace, resigned. H. R. Safford, hitherto Principal Assistant Engineer, has been appointed Assistant Chief Engineer, effective March 20.

Lehigh Valley.—G. H. McFadden has been elected a Director, succeeding B. Borie.

Missouri, Oklahoma & Gulf.—Frank C. Faust has been appointed Chief Engineer with headquarters at Muskogee, Ind. T., succeeding Geo. F. Morse, resigned.

National of Mexico.—F. E. Newman has been appointed Superintendent of Terminals, succeeding F. H. Lattig.

Norfolk & Western.—W. S. Battle, Jr., has been appointed General Claim Agent, with office at Roanoke, Va.

Oregon Short Line.—R. S. Lovett has been elected a Director, succeeding H. G. Burt.

Panama.—John F. Wallace has been appointed General Superintendent, succeeding J. R. Shaler, resigned.

Pennsylvania.—The following appointments have been made: Alexander C. Shand, Engineer of Maintenance of Way, to be Assistant Chief Engineer; L. R. Zollinger, Principal Assistant Engineer of the Pennsylvania Railroad Division, to be Engineer of Maintenance of Way; A. J. Whitney, Assistant Engineer of the Cape May Division, to be Principal Assistant Engineer of the P. R. R.; J. H. Gumbal, Assistant Engineer of the Monongahela Division, to be Assistant Engineer of the Cape May Division; A. B. Cuthbert, Assistant Engineer of the Elmira and Canandaigua Division, to be Assistant Engineer of the Monongahela Division; Walter Thomson, who has been doing special duty on the Philadelphia and Erie Division, has been appointed to the position vacated by Mr. Cuthbert.

Pennsylvania Company.—H. E. Newcomet has been transferred from the Cincinnati Division to the Erie and Ashtabula Division. George LeBoutillier has been transferred from the Cleveland and Pittsburg Division to the Cincinnati Division and H. E. Culbertson has been transferred from the Erie and Ashtabula Division to the Cleveland and Pittsburg Division.

Pittsburg, Lisbon & Western.—C. Z. Hughes has been appointed Traffic Manager, with headquarters at Lisbon, O.

Southern.—Dr. W. A. Applegate has been appointed Chief Surgeon, with headquarters at Chattanooga, Tenn.

Spokane Falls & Northern.—The authority of George T. Slade, General Superintendent of the Great Northern, has been extended over the S. F. & N.

Wheeling & Lake Erie.—The headquarters of this company have been removed from Cleveland, O., to Pittsburg, Pa.

LOCOMOTIVE BUILDING.

The Michigan Central has ordered 19 locomotives from the Schenectady Works of the American Locomotive Co.

The Boston & Albany has ordered 16 passenger and freight locomotives from the American Locomotive Co.

The Southern Pacific has ordered an oil-burning locomotive, which, it is reported, will make 100 miles an hour, from the International Power Co., of Providence, R. I.

CAR BUILDING.

The Southern is reported to have ordered 1,000 coal cars from Haskell & Barker.

The Savannah Electric Co. has ordered 10 28-ft closed cars from the St. Louis Car Co.

The Los Angeles Pacific has ordered 10 combination cars from the St. Louis Car Co.

The Philadelphia & Reading is reported to

have ordered six coaches from the Pullman Co.

The Los Angeles Railway has ordered 40 combination cars from the St. Louis Car Co.

The St. Louis & San Francisco is reported to have ordered 1,100 additional freight cars.

The Paducah City Railway Co. has ordered a small number of cars from the St. Louis Car Co.

The Goodwin Car Company has ordered 12 cars from the Allegheny Works of the Pressed Steel Car Co.

The Chicago, Rock Island & Pacific is reported to have ordered 485 coal cars and 250 convertible coal and ballast cars.

The Minneapolis & St. Louis denies the report that it has ordered two passenger cars from the Pullman Co., as reported in our issue of March 10.

The Atchison, Topeka & Santa Fe has ordered 38 of the 60 coaches reported in our issue of February 24, from the St. Charles Works of the American Car & Foundry Co.

The Boston Elevated has ordered 40 semi-convertible cars from the J. G. Brill Co. They are to measure 32 ft. long, 6 ft. 4 in. over side sheathing and are to have a new style of grooveless posts.

The Coal & Coke Railroad, as reported in our issue of March 3, has ordered 300 freight cars from the South Baltimore Steel Car & Foundry Co., and, in addition, has ordered 200 freight cars from the Huntington Works of the American Car & Foundry Co.

The Indianapolis Abattoir Company, as reported in our issue of March 17, has ordered 75 dressed beef refrigerator cars of 60,000 lbs. capacity, from the American Car & Foundry Co. These cars will be 36 ft. long and 8 ft. 10 in. wide, with wooden frames and underframes.

The New York Central & Hudson River has ordered 1,000 gondola cars of 80,000 lbs. capacity from the Western Steel Car & Foundry Co., for May delivery. These cars will be 35 ft. 7½ in. long, 9 ft. 8 in. wide and 4 ft. 1½ in. high, all inside measurements. The special equipment includes: Magnus Metal Co.'s brasses, Miner draft rigging and McCord journal boxes.

The Bangor & Aroostook, as reported in our issue of March 10, has ordered six cabooses from the American Car & Foundry Co., for delivery this summer. These cabooses will weigh about 35,000 lbs., and measure 40 ft. long, 9 ft. 3 in. wide and 7 ft. 10 in. high. The special equipment will include: Streeter brake shoes, Westinghouse air-brakes, Tower couplers, Miner draft rigging and French springs.

The Chicago, Milwaukee & St. Paul, as reported in our issue of March 10, has ordered 10 passenger cars from Barney & Smith. These cars will be 60 ft. 6 in. long, 10 ft. wide and 10 ft. high. The special equipment will include: Diamond special brake beams, Congdon brake shoes, New York air-brakes, Washburn drop head couplers, Forsyth's Gold Star curtain fixtures, Pantasote curtain material and Pullman wide vestibules, with Acme diaphragm.

The Detroit & Toledo Shore Line, as reported in our issue of Feb. 23, has ordered 100 plain gondola cars of 30,000 lbs. capacity, from the American Car & Foundry Co., for delivery the latter part of April. The cars will weigh approximately 34,000 lbs., and measure 36 ft. long, 9 ft. 8½ in. wide, over sills, and 4 ft. ½ in. high, inside. The special equipment will include: American Car & Foundry Co.'s bolsters, Monarch brake beams, Westinghouse air-brakes, Tower couplers, Butler draft rigging, arch-bar trucks and American Car & Foundry Co.'s wheels.

The Hocking Valley has ordered two parlor observation cars from the Pullman Co., for June delivery. These cars will be 70 ft. long and 9 ft. 8 in. wide, over sills. The special equipment includes: Diamond special brake beams, Christie brake shoes, New York air-brakes, Buckeye couplers and draft rig-

ging, National curtain fixtures, Pantasote curtain material, Harrison dust guards, Chicago Car Heating Co.'s heating system, Pintsch light, Pullman standard paint, platforms, roofs, trucks and vestibules and Boies wheels.

The East St. Louis & Suburban, as reported in our issue of March 17, has ordered 200 gondola cars of 80,000 lbs. capacity, from the American Car & Foundry Co., for October delivery. These cars will weigh 32,000 lbs., and measure 36 ft. long, 9 ft. 4 in. wide and 3 ft. 6 1/4 in. high. The special equipment includes: American Steel Foundry's bolsters, Dexter brake beams, American Car & Foundry Co.'s brake shoes, trucks and wheels, Westinghouse air-brakes, Caimax couplers, Miner draft rigging, Woodman journal boxes and lids and Railway Steel Spring Co.'s springs.

BRIDGE BUILDING.

ALGONA, IOWA.—Bids are wanted April 5 by L. E. Potter, Auditor, for building a steel bridge in Kossuth County.

ATLANTA, GA.—Bids are wanted April 3 by the Mayor and General Council for the completion of the Edgewood avenue bridge, 400 ft. long and 60 ft. wide, to be built of reinforced concrete. R. M. Clayton is City Engineer.

DES MOINES, IOWA.—The bids for building two additional melon arches on the Sixth avenue bridge opened March 18 were as follows: John Deans Co., of Chicago, \$26,200; William Horabin, Iowa City, \$29,900; John Gilligan & Co., Falls City, Neb., \$31,988; Marsh Bridge Co., Des Moines, \$32,794; O. P. Herrick, Des Moines, \$32,800; J. E. Griffith & Co., Des Moines, \$33,425; Christie Construction Co., Des Moines, \$33,800; Des Moines Bridge & Iron Works, Des Moines, \$36,896; W. F. Cook, Des Moines, \$38,700; N. W. Stark & Co., Des Moines, \$42,900; Midland Bridge Co., Kansas City, \$44,560. The contract has not yet been awarded.

HAYFORK, CAL.—Bids will be asked early in October by the Clerk of the Board of Supervisors for building a bridge 330 ft. long over Trinity river at Lewiston. T. J. Montgomery is County Surveyor.

INDIANAPOLIS, IND.—Bids are wanted April 5 by the Board of County Commissioners for a retaining wall to the Fall creek bridge at Hammonds Park, in Marion County. John McGregor is County Commissioner.

LINCOLN, NEB.—Bids are wanted April 1 by W. L. Dawson, County Clerk, for building all the bridges that may be needed for one year in Lancaster County.

LOS ANGELES, CAL.—The Seventh street bridge over the Los Angeles river has been carried away by high water. Two persons were drowned.

NEWARK, N. J.—Essex and Hudson counties are planning to build a new drawbridge over the Passaic river in connection with the proposed widening and improvement of the Plank road, at a cost of about \$300,000.

ORTIZ, CHIHUAHUA, MEX.—A contract has been given by the Mexican Central to Bell & Seems, of Mexico City, for building a steel and masonry bridge 1,800 ft. long over the river.

SPOKANE, WASH.—The Spokane International will build three large bridges on the line of its road between this place and Moyie, B. C. E. G. Taber is Chief Engineer.

SPRINGFIELD, MASS.—The Boston & Albany has given a contract to the Boston Bridge Works, of Boston, for building the new bridge over the Connecticut river, which calls for 3,000 tons of structural steel. Work is to be completed by January 1 next.

WELLAND, ONT.—Bids are wanted March 28 by Robert Cooper, County Clerk, for building a bridge over the Welland river, two miles from Perry station.

WILMINGTON, DEL.—Newcastle County, it is reported, is planning to spend \$500,000 for

two bridges over the Christiana river, one at Market street, to cost \$250,000, and the other at Fourth street, to cost a similar amount.

WINNIPEG, MAN.—Bids are wanted by J. E. Schwitzer for building seven arches and culverts on the La Riviere section of the Canadian Pacific, five on the Fort William section, three on the Rat Portage section, three on the Ignace section, and one of 300 ft. on the Portal section.

Other Structures.

ASHTABULA, OHIO.—The Lake Shore & Michigan Southern is planning to enlarge its shops at this place.

CINCINNATI, OHIO.—Bids are wanted April 3 by the trustees of the Cincinnati Southern for building a concrete freight station two stories high, 45 x 130 ft., outbound freight house 25 x 1,100 ft., and inbound freight house 42 x 1,100 ft., with a platform 8 ft. wide and 1,060 ft. long between tracks, between Vine and Plum and Commerce and Front streets. Stanley Ferguson is Secretary of the Board of Trustees.

DENNISON, OHIO.—The Pennsylvania Lines West are planning to put up a new roundhouse and additional shops at this place, at a cost of about \$300,000.

DU BOIS, PA.—The Buffalo, Rochester & Pittsburg, it is reported, will make additions to its shops. The locomotive shop is to be 80 x 450 ft. and will be equipped with new machinery and appliances, including an overhead electric traveling crane.

GREENVILLE, PA.—The Pittsburg, Bessemer & Lake Erie Railroad (the Carnegie Steel Company's ore line) will add a car repair shop to its shop facilities at this place to cost \$25,000.

HOBOKEN, N. J.—The Delaware, Lackawanna & Western has plans ready for building a large passenger and freight terminal at a cost of about \$1,500,000.

MINNEAPOLIS, MINN.—The Minneapolis, St. Paul & Sault Ste. Marie, it is reported, will begin work at once on additions to its machine shops 123 ft. long x 138 ft. wide, to cost about \$40,000.

NEW RICHMOND, WIS.—The Chicago, St. Paul, Minneapolis & Omaha is planning to put up a roundhouse and coal sheds and make some other improvements at this place.

PUEBLO, COLO.—The Denver & Rio Grande, according to reports, is planning to put up shops at this place.

SPRINGFIELD, OHIO.—The Cleveland, Cincinnati, Chicago & St. Louis, it is reported, has decided to put up a new passenger station.

TERRELL, TEX.—The Texas Midland is putting up a machine shop 60 x 125 ft., paint shop 60 x 150 ft., and car shop 60 x 175 ft., at a cost of about \$25,000, for which the contract has been given to Sonnefeld & McCord, of Dallas, Tex.

TORONTO, ONT.—An agreement, it is reported, has been reached between the Board of Control and the Grand Trunk officials, under which the railroad secures the whole block south of Front street between York and Bay streets, and the southern part of the remaining block to Yonge street, on which it will put up a union station to cost about \$1,000,000.

WACO, TEX.—Work is to be commenced at once on a new stone passenger station for the joint use of the St. Louis Southwestern and the International & Great Northern, to cost about \$75,000.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALTON, GRANITE & ST. LOUIS TRACTION.—This company's new line from Alton, Ill., to Granite City, 16 miles, was opened to traffic on March 1. This gives the company a through line from Alton, Ill., to East St. Louis. From East St. Louis into St. Louis,

via the Eads bridge, a line is being built on private right of way. This is to be put in operation this summer.

ATCHISON, TOPEKA & SANTA FE.—This company has awarded to the Lantry-Sharp Contracting Co., Kansas City, Mo., two large contracts for grading and masonry work on the new second track at various points between Chicago and Newton, Kansas. It is understood that the most of the team work will be sub-let, and that the Lantry-Sharp Co. will do the masonry and steam shovel work themselves.

ATLANTA, BIRMINGHAM & ATLANTIC (ATLANTIC & BIRMINGHAM).—This company has been incorporated by the Atlantic & Birmingham to build an extension of the latter road from Montezuma, Ga., to Birmingham, Ala., 241 miles, with a branch from Wedowee, Randolph County, Ala., on the proposed extension, northeast to Atlanta, Ga., 5 miles. The first section of 50 miles on the extension will be ready for graders by April 1st or earlier. Profiles can be seen at Oglethorpe, Ga., after March 26, and contracts for work in large or small amounts will then be let. A. Bonnyman is Chief Engineer.

ATLANTIC & BIRMINGHAM.—See Atlanta, Birmingham & Atlantic above.

CALIFORNIA ROADS.—The Western Lumber Co., of Jenner, Cal., is reported to have awarded a contract to the Hutchinson Construction Co. for building a road three miles long from Jenner to the Pacific Ocean.

CHESAPEAKE & OHIO.—It is reported that this company will this year spend \$1,500,000 on maintenance of way improvements, particularly double tracking and increase of yard facilities. Ten miles of the Peninsula Division, 25 miles between Winifrede, W. Va., and Huntington, and about 13 miles near Cincinnati, on the Cincinnati Division, will probably be double tracked; and new yards will be made at Thurmond, W. Va., and Russell, Ky.

CUMBERLAND VALLEY.—Works is under way on 4.6 miles of second track on this road between Greencastle, Pa., and Mason Dixon, on the Pennsylvania-Maryland state line. This work includes a revision of grades and important changes of alignment and is to be finished this summer. During 1904 three miles of second track between Marion, Pa., and Guilford Springs were put in operation, and 2.35 miles between Guilford Springs and Chambersburg have since been finished. When this work is completed the company will have 23.83 miles of double track.

FOURCHE RIVER VALLEY & INDIAN TERRITORY.—This company has been granted a charter by the State Board of Railway Incorporation of Arkansas, with a capital of \$20,000, to build from a point on the Choctaw, Oklahoma & Gulf, near Esau, in Perry County, along the south side of Fourche la Pave Creek to a point on the line between Perry and Yell counties, near Jennings Falls, 35 miles. F. H. Hartshorne, of Esau, Ark., is President, and R. B. Edgar, of Esau, N. P. Bigelow, of Lake Forest, Ill., and Charles Neimeyer, of Little Rock, Ark., are directors.

FOX RIVER VALLEY (ELECTRIC).—This company has applied to the Manitowoc (Wis.) City Council for a 35-year franchise to build an interurban electric railroad from Sheboygan north to Manitowoc, 24 miles, and thence west to Kaukauna, 35 miles, all paralleling the Chicago & Northwestern. O. C. Behnke is said to be interested.

GURDON & FORT SMITH.—See Missouri Pacific below.

HELM & NORTHWESTERN.—See Yazoo & Mississippi Valley below.

ILLINOIS CENTRAL.—An officer writes that the following construction work is now in progress:

A divergence three miles in length, to be used as a section of second track for north-bound business, is being built at Fowlkes, Tenn., by the Lewis Montville Construction Co. This work involves a reduction of grade from 1.25 per cent. to 0.5 per cent.

A new double-track four miles long through the hilly country back from the Mississippi river at Wickliffe, Ky., near Cairo, Ill., is being built by W. J. Oliver, of Knoxville, Tenn., contractor. This work is made necessary by the caving banks of the river, which makes the present line difficult to maintain.

A new connecting line is being built from Herrin, Ill., in Williamson County, to Ziegler, in Franklin County, seven miles, by C. D. Smith & Co., contractors, of Memphis, Tenn. This road is to connect two different lines in the coal district and to reach new mines.

The new bridge over the Tennessee river at Gilbertsville, Ky., on the new location, is nearly completed. The Walsh Construction Co., of Davenport, Iowa, is the contractor for grading; the Bates & Robinson Co., of Chicago, for the piers and abutments; the American Bridge Co., of New York, for the iron work, and the Kelly-Atkinson Construction Co., of Chicago, for the erection of the bridge.

See Yazoo & Mississippi Valley below.

JOHNSON CITY, BAKERSVILLE & SOUTHERN.—Press reports state that this company has been chartered in Tennessee to build from Johnson City south through Unicoi County to the North Carolina state line, 18 miles. William E. Uptegrove is said to be interested.

LEHIGH VALLEY.—This company is to build a line three miles long from Lyons Farms, N. J., to Irvington, and, it is said, has let the contract to John F. Dolan, of Elizabeth, N. J. The cost of the work will be about \$75,000.

LITTLE ROCK & HOT SPRINGS (ELECTRIC).—This company has been incorporated in Arkansas with an authorized capital stock of \$2,000,000 of which \$9,000 has been subscribed, to build an electric railroad from Little Rock southwest to Hot Springs, 50 miles.

MARION & NORFOLK.—This company has been organized in Virginia to build a railroad, and surveys are now in progress. J. H. Hyde, E. P. Prentiss, W. K. Bixbee and R. M. Galloway are incorporators. J. H. Glenn is Secretary and Treasurer.

MEMPHIS, HELENA & LOUISIANA.—See Missouri Pacific below.

MICHIGAN CENTRAL.—This company is reported to have begun work on double-tracking the main line from Kalamazoo, Mich., to Niles, 48 miles.

MISSOURI PACIFIC.—The annual report of this company, recently issued, describes improvements and extensions as follows: The following work was completed during the year:

On the White River branch, 103.15 miles.
On the Memphis, Helena & Louisiana line, 24.66 miles.

The Herrin Railway, which branches from the East & Western Illinois branch at Bush station and extends southeasterly 7.72 miles to a connection with the tracks of the Big Muddy Coal & Iron Co., near Herrin, Ill., was completed and put in operation.

The Ziegler extension to Ziegler, Ill., on the Illinois Central, 5.19 miles, was put in operation.

The Farmerville & Southern Railroad, which extends south from a connection with the Little Rock & Monroe, six miles south of Felsenthal, Ark., to Farmerville, Union Parish, La., 22.59 miles, was put in operation.

The El Dorado & Bastrop from the Arkansas and Louisiana state line to El Dorado, 44 miles, was completed and put in operation.

The Carthage & Western, which runs from a connection with the Lexington & Southern Division north of Carthage, Mo., to a connection with the Kansas City Southern, at Asbury, Mo., 17.96 miles, was completed and put in operation.

The Fort Smith Suburban, which connects with the Fort Smith branch and forms a belt line 6.3 miles long about the city of Fort Smith, Ark., has been completed and put in operation this month.

The Pine Bluff & Western, which runs from a connection with the old Little Rock, Mississippi River & Texas (St. Louis, Iron Mountain & Southern), at Pine Bluff, to a connection with the Little Rock & Hot Springs Western at Benton, Ark., 44.53 miles, was purchased from the Sawyer & Austin Lumber Co.

The Coal Belt Railway, which extends north and south from the eastern terminus of the Herrin Railway, in Williamson County, Ill., and forms a connection between the Herrin Railway and the Coal Belt Electric Railway, was acquired. This has 3.84 miles of main track and 7.23 miles of side track.

The Coal Belt Electric Railway, which extends eastward from the south end of the Coal Belt Railway to Marion, the county seat of Williamson County, and westward to Cartersville; also from Marion north to Spilerton, a total of 16.27 miles, was acquired during the year. This is operated partly by electricity and partly by steam.

Construction work is now under way on the following lines: The White River branch, beginning at White River Junction, two miles west of Batesville, Ark., and extending northwesterly through northern Arkansas and southwestern Missouri to Carthage, Mo., 239.5 miles, was begun in June, 1901. Grading is now fully completed except through the tunnel at Omaha, Ark. From White River Junction to Oregon, 127.21 miles, and from Carthage, Mo., to Reed Springs, 69.54 miles, this line is in operation. Of the remaining 43 miles, track has been laid to a point three miles beyond Oregon and two miles beyond Reed Springs, leaving 38 miles of track still to be laid. On this distance, the Omaha tunnel, which is 2,650 ft. long, is about 60 per cent. completed.

The Memphis, Helena & Louisiana Railway, which extends from the Louisiana-Arkansas state line north to Halley, Ark., 38.16 miles; from McGehee to Latour, 81.43 miles, and from Marianna to West Memphis, 48.85 miles; total, 168.44 miles, is in operation from the state line to Halley, 38.16 miles, and from McGehee to Bonham, 22.39 miles. Grading is completed and track laid from Bonham to the crossing of the Arkansas River, 3½ miles, where the bridge is nearly completed. From Latour south to the crossing of the White River, 51 miles, the grading and bridge work is nearly completed. Work on the line between Marianna and West Memphis has been for some time suspended.

The Gurdon & Fort Smith is projected from a connection with the Arkansas Southwestern at Antoine, Ark., to Caddo Gap, a point on Caddo River, 35 miles west of Hot Springs, 30 miles. Three miles of track is laid and grading is now under way on two miles more.

The Springfield Southwestern, a projected line from Springfield, Mo., to a connection with the White River branch, is now being surveyed. Right of way has been secured for the one mile graded south of Springfield.

NEW YORK & JERSEY (TUNNEL) RAILROAD.—The Mayor of New York has signed the ordinance repassed by the Board of Aldermen granting this company permission to extend its tunnel northward under Sixth avenue and eastward under Ninth street, Manhattan.

NEW YORK, NEW HAVEN & HARTFORD.—Press reports state that the contract for widening the cut through the city of New Haven so that it will accommodate four tracks has been let to C. B. Blakeslee & Sons, of New Haven. Before work can be begun, the Railroad Committee of the Connecticut Legislature must act upon the appeal by the city of New Haven from the decision of the Connecticut Railroad Commission allowing the improvement to be made. The contract will involve raising the grades of thirteen streets.

NORFOLK & WESTERN.—This company, it is reported, has let contracts for double tracking its line between Ironton, Ohio, and Hanging Rock, three miles.

PINE BLUFF & SOUTHERN.—This company has been chartered to build from Pine Bluff, Ark., via Ladd, Barry and Yorktown, to Star

City, Mo.; S. C. Alexander, W. H. Langford and R. G. Atkinson, of Pine Bluff, Ark., are directors.

RALEIGH & CAPE FEAR.—It is reported that this company will immediately begin work on an extension from Lillington, its southern terminus, south to Fayetteville, 25 miles. Surveys are now being made and the contract for a bridge over the Cape Fear River at Lillington will probably be let at once. The road runs at present from Raleigh south to Lillington, 35 miles.

SOUTHERN PACIFIC.—Press reports state that this company is making surveys for a branch from Toano, Nev., on the Central Pacific, south by way of Cherry Creek to Ely, 147 miles, to be extended later on to a connection with the San Pedro, Los Angeles & Salt Lake, thus making a north and south line through the State of Nevada.

SPOKANE & INTERNATIONAL.—An officer writes that this company, which was incorporated in the State of Washington in January, will build a line at once from Spokane northeast to Moyie, B. C., on the Canadian Pacific's Crows Nest Pass line, 130 miles. The maximum grade is to be 1 per cent. There will be three large bridges and two short tunnels through rock. Over this route, by a connection with the Canadian Pacific and the Minneapolis, St. Paul & Sault Ste. Marie, the line from Spokane to Minneapolis and St. Paul will be 10 miles shorter than by any existing road. Chester W. Chapin is President, and E. G. Taber, of Spokane, is Chief Engineer.

ST. LOUIS, ROCKY MOUNTAIN & PACIFIC.—Press reports state that this company has been incorporated in New Mexico, with a capital of \$2,250,000, to build from Raton, N. Mex., along the Cimmaron River to Cimmaron, and through the Cimmaron canyon to Elizabethtown, 72 miles. Hugo Koehler, of St. Louis, and Jeremiah Lehy and C. N. Blackwell, of Raton, N. Mex., are incorporators.

SIKESTON & SOUTHWESTERN.—This company has been granted a charter in Missouri to build from Sikeston, Mo., to a point on the Mississippi River opposite Hickman, Ky., 20 miles. J. F. Gould, F. M. Sikes and Walter L. Hensley, of Farmington, Mo., G. B. McCoy, of Sikeston, and M. McGouey, of St. Louis, are incorporators.

SPRINGFIELD SOUTHWESTERN.—See Missouri Pacific above.

TOMBIGBEE VALLEY.—This company has let a contract to Beatty & Williams, of Healing Springs, Ala., and R. M. Newell for building a 40-mile extension from Healing Springs to Butler. N. G. Kolb, Fairford, Ala., is Chief Engineer.

WABASH SOUTHERN.—This company has been incorporated at Springfield, Ill., with a capital of \$10,000, to build from Zeigler north to Shumway, 80 miles.

WASHINGTON & COLUMBIA RIVER.—This company recently purchased a narrow-gauge line from the Oregon Railroad & Navigation Co. and has begun changing it to standard gauge.

WHITE RIVER VALLEY.—This company has been incorporated in South Dakota with an authorized capital stock of \$50,000,000 to build from Chamberlain, S. Dak., the present western terminus of the Chicago, Milwaukee & St. Paul, westward to the western boundary of the state, 250 miles. It is reported that work has been begun in the neighborhood of Deadwater. This is a different company from the White River Valley Company in Colorado, reported in our Construction Supplement.

WINDSOR, ESSEX & LAKE SHORE.—It is reported that bids are being received for building this proposed line from Windsor, Ont., opposite Detroit, Mich., through Essex, Kingsville, Leamington, Wheatley, Tilbury and Buxton to Chatham, according to the charter granted by the legislature of the province of Ontario. Phillip Heseltine, Chamber of Commerce Building, Detroit, Mich., is General Manager.

WINSTON-SALEM SOUTH BOUND.—This company has been organized under a charter recently granted by the legislature of North Carolina to build a connection between the Norfolk & Western and the Southern on the north and the Atlantic Coast Line and the Seaboard Air Line on the south, about 80 miles long. W. T. Brown is President and James S. Dunn is Secretary and Treasurer.

YAZOO & MISSISSIPPI VALLEY (ILLINOIS CENTRAL).—An officer writes that the following construction work is now under way:

A new line is being built, under the name of the Helm & Northwestern Railroad, from Helm, Washington County, Miss., northward $7\frac{1}{2}$ miles. Grading is nearly completed by the contractors, the Hutton Co., of Memphis, Tenn.

A projected line is under survey from Silver City, Yazoo County, Miss., to Valley Park, Issaquena County, 45 miles.

A line is proposed from Philipp, Tallahatchie County, Miss., north up the Tallahatchie river, 40 miles. This is under survey.

RAILROAD CORPORATION NEWS.

ALBANY & SUSQUEHANNA.—See Delaware & Hudson below.

ATLANTIC COAST LINE.—Kinnicutt & Potter have recently offered at 102½ and interest, \$1,500,000 first consolidated mortgage 4 per cent. gold bonds of 1952, of this railroad company. The authorized issue is \$80,000,000; but the bonds outstanding must never exceed \$20,000 per mile, including existing mortgage bonds, for the entire mileage of railroads owned by the company. The amount now outstanding is \$37,865,000, equal to \$18,948 per mile.

BALTIMORE, CHESAPEAKE & ATLANTIC (PENNSYLVANIA).—The tenth annual report of this company for the 16 months ended Dec. 31, 1904, shows gross earnings of \$1,124,009, a decrease of \$44,292; operating expenses of \$920,130, an increase of \$52,183, and net earnings of \$203,879, a decrease of \$96,476 over the preceding year. The net income was \$116,223, an increase of \$6,419 over 1903.

The first dividend, 2 per cent., on the \$1,500,000 5 per cent. cumulative preferred stock has been declared by the directors. See Maryland, Delaware & Virginia below.

BANGOR (MAINE) RAILWAY & ELECTRIC COMPANY.—Preparations are reported in progress for the consolidation, under the name of this company, of the Bangor, Hampton & Winterport Railroad Co., the Bangor Street Railroad Co., and the electric lighting properties of the Public Works Co.

BUFFALO, ROCHESTER & PITTSBURG.—A certificate has been filed with the Secretary of State at Albany, N. Y., to provide for an increase of the capital stock of this company from \$15,000,000 to \$18,000,000.

CANADA COAL & RAILWAY COMPANY.—On March 18, the mines and railroad property of this company were sold at auction in Amherst, N. S., and were bid in in the interest of the bondholders for \$50,500. Included in this sale was a tract of 1,909 acres of timber lands.

CHICAGO & ALTON.—This company has filed in Chicago a supplementary mortgage dated March 16, 1905, with the Illinois Trust and Savings Bank as trustee for \$5,000,000, under which first-mortgage 3 per cent. 50-year gold bonds are to be issued.

CHICAGO CITY RAILWAY.—The City Council of Chicago, as a result of the partial victory of the Chicago City Railway Co., in the 99-year franchise cases, and to prevent the company from carrying the contest into the United States courts, met in emergency session on the evening of March 20 and immediately brought suit against the company in the state courts. In addition the Council annulled all the city ordinances, franchises and privileges under which the company operates. It was agreed that the company should be

allowed to operate cars until the franchise cases are settled. The Chicago City Railway was bought in February, for \$30,000,000, by a syndicate headed by J. P. Morgan and Thomas Ryan, of New York, and Marshall Field, P. A. Valentine and John J. Mitchell, of Chicago.

CHICAGO, ROCK ISLAND & PACIFIC.—A dividend of 2 per cent. has been declared on the stock of the Chicago, Rock Island & Pacific Railway.

CINCINNATI, HAMILTON & DAYTON.—The terms of the lease of the Pere Marquette to the Cincinnati, Hamilton & Dayton are the payment of 4 per cent. on the \$12,000,000 preferred stock and 5 per cent. on the \$6,000,000 common stock. The Cincinnati, Hamilton & Dayton owns \$12,854,500 of the common stock. Redmond & Co., of New York, have purchased the entire issue of \$15,000,000 3½ year 4½ per cent. gold collateral notes due September 1, 1908, of this company. These notes were issued to retire maturing blocks and make no increase in the company's indebtedness. The collateral securing the issue is as follows: Cincinnati, Hamilton & Dayton, 4½ per cent. consolidated mortgage bonds of 1905, \$15,000,000; Cincinnati, Hamilton & Dayton 5 per cent. preferred stock, \$6,700,000; Cincinnati, Hamilton & Dayton 4 per cent. preferred stock, \$1,072,000; bonds of constituent companies, \$375,000; Southwestern Construction Co.'s stock (total issue, \$3,000,000), 7,501 shares. The Southwestern Construction Co.'s stock represents a joint ownership with the Southern of the Cincinnati, New Orleans & Texas Pacific (Queen & Crescent Route).

This company has sold to Rudolph Kleybolte & Co. an issue of \$1,080,000 4½ per cent. equipment trust certificates dated April 1, 1905, due in 20 semi-annual installments of \$45,000 each, from Oct. 1, 1906, to April 1, 1916, inclusive. These notes are being offered by the bankers and are described in the advertisement as issued for 90 per cent. of the cost of new equipment, consisting of 264 cars (passenger, baggage, combination mail and baggage, postal and steel coal cars) and 30 locomotives, 10 per cent. of the cost having been paid in cash.

CLEVELAND, LORAIN & WHEELING.—This company, whose two previous dividends on the preferred stock were 3 per cent. in 1896 and 2½ per cent. on December 15, 1904, has declared a dividend of 2½ per cent. on the preferred stock, "as the full dividend of 5 per cent. per annum for the year ended December 31, 1904."

CONSOLIDATED RAILWAY (N. Y., N. H. & H.).—The New York, New Haven & Hartford, through this company, has made arrangements to purchase control of the Hartford (Conn.) Street Railway Co., paying \$285 in cash per share (par \$100) both for the Hartford Street Railway and the East Hartford & Glastonbury Horse Railroad Co.'s convertible debentures. The capital stock of the Hartford Street Railway is \$1,000,000, and there are \$200,000 of the convertible debentures of the East Hartford & Glastonbury Railway.

The sale of the Springfield (Mass.) Street Railway Co. to the New York, New Haven & Hartford is reported from Boston, and the price is said to be \$235 a share. The Springfield Co. has 65 miles of track and is capitalized at \$1,958,400. Last year its gross earnings were \$947,862.

DETROIT SOUTHERN.—The foreclosure sale of this road is advertised for May 1 at Springfield, Ohio, the minimum acceptable bid to be \$1,000,000, subject to the \$4,500,000 mortgage of 1901 on the Ohio Southern division. The voting trust agreement of June 1, 1901, has been terminated, and holders of preferred and common stock may exchange their certificates at the New York Trust Co.

DELAWARE & HUDSON.—The stockholders of the Albany & Susquehanna have been notified that a special meeting will be held in Albany on April 7 to act upon a proposi-

tion to make a new mortgage for \$10,000,000 to secure an issue of 3½ per cent. 40-year gold mortgage bonds bearing interest from April 1, 1906, to be guaranteed principal and interest by the Delaware & Hudson Co. These new bonds are for the redemption of the \$10,000,000 first consolidated mortgage bonds of the A. & S., bearing interest at 6 and 7 per cent., maturing April 1, 1906. These proposed new bonds are to be issued under an agreement that whenever the Delaware & Hudson Co. shall surrender to the Albany & Susquehanna any of these new 3½ per cent. bonds, the latter company will issue to the Delaware & Hudson in return an equal amount at par of its 4 per cent. preferred stock, guaranteed by the Delaware & Hudson, and that the bonds so surrendered shall be cancelled. Stockholders of the Albany & Susquehanna are also to be asked to authorize an increase of \$10,000,000 in the capital stock, which may be used, as stated above, in retiring an equal amount of the proposed new 3½ per cent. bonds.

GRAND TRUNK.—The Railroad Committee of the Dominion Government has approved the bills authorizing the acquisition by the G. T. of the Canada Atlantic, which runs from Parry Sound on Georgian Bay east to Swanton, Vt., 409.7 miles, with 37.4 miles of branches. The bills authorize the issue of securities to the amount of \$16,000,000.

GREAT NORTHERN.—Clark, Dodge & Co., of New York, are offering at 104¼ and interest \$4,848,484 St. Paul, Minneapolis & Manitoba, Pacific extension, 4 per cent. gold bonds of 1940. These are secured by a first mortgage on all of the Great Northern's lines in Idaho and Washington, a total of 435.60 miles; also by a second mortgage on 383.23 miles of line in Montana, subject to \$21,687,000 Montana extension first-mortgage 4s, of which \$11,502,000 are deposited with the trustee of this mortgage as additional security. The Pacific extension bonds are part of \$19,440,000 outstanding of the authorized issue of \$29,016,000.

IOWA & ILLINOIS (ELECTRIC).—It is announced that this electric road, which is to run from Davenport, Iowa, to Clinton, 36.4 miles, with passenger traffic agreements into Rock Island and Moline, Ill., is nearly completed, and partly in operation by Pepper & Register, Fidelity Mutual Life Building, Philadelphia, contractors. The cost of the road is said to be \$1,260,000. Bonds to the amount of \$1,050,000 are to be offered as soon as the road is completely ballasted and in operation. These are 20-year 5 per cent. first mortgage gold bonds, subject to call at any interest period at 105 and interest. An additional \$950,000, making a total issue of \$2,000,000, are retained in the treasury. Stock is authorized to the amount of \$1,575,000, of which \$1,500,000 is outstanding.

LONG ISLAND (PENNSYLVANIA).—This company has sold to Kuhn, Loeb & Co. an additional \$6,000,000 4 per cent. first and refunding bonds of 1904 guaranteed by the Pennsylvania and issued for new terminal facilities and equipment. The authorized issue of \$45,000,000 is divided as follows: Issued and outstanding, \$17,891,000; available in treasury, \$4,517,000; reserved for refunding, \$22,592,000.

LOUISVILLE & NASHVILLE.—A petition for an injunction has been filed by a minority stockholder of the South & North Alabama Railroad to enjoin the Louisville & Nashville from voting the 90 shares of stock in the South & North Alabama owned by it in favor of the plan to sell the latter road to the Louisville & Nashville for \$27.50 a share, until it has been determined by the courts whether that is a fair price for the stock. A temporary injunction was granted and on petition of the counsel for the Louisville & Nashville, the case has been removed to the United States court.

MARYLAND, DELAWARE & VIRGINIA (PENNSYLVANIA).—Rudolph, Kleybolte & Co., of New

York, have recently offered at 115½ and interest an issue of \$2,000,000 first mortgage 5 per cent. 50-year gold bonds of 1955, guaranteed principal and interest by the Baltimore, Chesapeake & Atlantic. A circular says in part: "Both the Maryland, Delaware & Virginia and the Baltimore, Chesapeake & Atlantic are controlled through ownership of stock by the Pennsylvania Railroad Co. and allied lines. The Maryland, Delaware & Virginia consists of 78 miles of standard-gauge road, extending from Queenstown to Lewes, Del., and a fleet of 17 steamboats, running between Baltimore & Queenstown, Washington, Fredericksburg, Norfolk and intervening points on the Patuxent, Potomac and Rappahannock Rivers. The actual annual gross earnings of the properties forming the Maryland, Delaware & Virginia prior to the present consolidation amounted to \$750,000. It is expected that under the new management net earnings will amount to at least 30 per cent. of this, or \$225,000. The interest on the present issue of bonds is \$100,000. A conservative estimate shows that the gross earnings under the Pennsylvania management will increase to at least \$1,200,000 a year." The \$330,000 prior lien bonds of the Queen Anne's Railroad were redeemed on March 1.

MEXICAN RAILROADS.—The Mexican Railway Association, which includes the Inter-oceanic Railway of Mexico, the Mexican Central, the Mexican International, the Mexican Railway and the National Railroad of Mexico, has made a new agreement which is now in operation for pooling imported goods for Mexico City or Pachuca.

MISSOURI PACIFIC.—The annual report of this company for 1904 shows gross earnings of \$43,693,617, compared with \$43,095,769 in 1903; operating expenses of \$30,406,041, compared with \$29,415,004 in 1903; net earnings of \$13,287,576, compared with \$13,680,765 in 1903; surplus of income for the year over all charges, \$5,925,634, compared with \$7,584,493 in 1903. The operating ratio for 1904 is 69.6 per cent. (See Construction columns.)

MUNCIE, HARTFORD & FORT WAYNE (ELECTRIC).—E. H. Rollins & Sons, of Chicago, have recently offered at par and interest, the unsold portion of \$1,000,000 first mortgage 5 per cent. gold bonds of 1935, subject to redemption at par and interest on and after January 1, 1925. A circular says that the property consists of a single-track electric line built almost entirely on private right of way and running from Muncie, Ind., north and east via Eaton, Hartford City, Montpelier, Keystone and Poneto to Bluffton, Ind., 48.8 miles. Gross earnings for 1904 were \$181,201; operating expenses, \$83,834, and net earnings, \$97,366.

MUSCATINE NORTH & SOUTH RAILWAY.—This company has been incorporated in Iowa as a successor of the Muscatine North & South Railroad, recently sold at foreclosure sale. The authorized capital stock is \$450,000. An extension of the road is projected. Joseph B. Clark, Bullitt Building, and John Graham, 435 Chestnut street, Philadelphia, are directors.

NEW ORLEANS RAILWAYS.—The New York Trust Co. announces that 94 per cent. of the bonds of 1902, 93½ per cent. of the preferred stock and 97 per cent. of the common stock have been deposited under the reorganization plan, which is declared operative. The receivers have been authorized by the United States Circuit Court to expend \$173,370 for new equipment, maintenance of way and additions to electric light plant.

NEW YORK & NORTH JERSEY RAPID TRANSIT.—This company, previously described in our Construction columns as incorporated to build a high-speed third-rail electric railroad from Weehawken, N. J., opposite Forty-fourth street, New York, through Passaic and Rutherford to Paterson, 13½ miles, is incorporated with \$200,000 capital

stock, which is to be increased later to \$7,000,000.

NEW YORK & PHILADELPHIA (ELECTRIC).—The Trenton & New Brunswick Railroad Co. is reported to have secured control of the Camden & Trenton and the New Jersey Short Line, and to be about to consolidate these electric roads into a new system, to be known as the New York & Philadelphia Electric Railway.

NORFOLK & SOUTHERN.—Lawrence Barnum & Co. are offering at 103 and interest a small block of this company's first general mortgage 5 per cent. gold bonds of 1904; authorized issue \$10,000,000, of which \$4,400,000 are outstanding, \$1,655,000 of which are reserved for refunding purposes.

PANAMA RAILROAD.—The report of this company for the year 1904 shows gross earnings of \$3,267,859, an increase of \$603,808 over 1903; operating expenses of \$2,055,604, an increase of \$295,267 over 1903, and net earnings of \$1,212,255, an increase of \$308,541 over 1903. Fixed charges are \$501,360, a decrease of \$1,285. This leaves a surplus of \$710,895, an increase of \$309,826 over 1903.

PENNSYLVANIA.—At the annual meeting held on March 14, the directors were authorized to issue \$50,000,000 bonds as required, either to be secured under the consolidated mortgage of 1873, or to be made convertible into capital stock at the option of the board. Part of the new issue is to be used to retire \$27,000,000 6 per cent. bonds maturing in June and July. In March, 1903, the stockholders authorized the sale of \$50,000,000 bonds, which have never been issued, which, with those just authorized make \$100,000,000 available for issue. The purchase of the Pittsburgh, Virginia & Charleston was also authorized by the stockholders.

PERE MARQUETTE.—See Cincinnati, Hamilton & Dayton above.

PITTSBURG, SHAWMUT & NORTHERN.—F. J. Lisman & Co., New York, are offering at about par \$470,000 of this company's 5 per cent. serial gold car trust bonds payable in 14 semi-annual installments. The issue is secured by 542 coal cars, 300 box cars, two baggage and mail cars and four locomotives of a total valuation of \$610,000.

RALEIGH & PAMLICO SOUND.—C. Russell Sage & Co., of New York, are offering at 91½ and interest \$30,000 first mortgage 5 per cent. gold bonds of 1934 of this company, which is building a line from Raleigh, N. C., via Wilson and Greenville, east to Washington, 114 miles, and has 6½ miles of track laid. The road is to be bonded at \$12,000 a mile.

ST. LOUIS & SAN FRANCISCO.—Farson, Leach & Co., New York, are offering at 98 and interest \$1,000,000 of this company's 4½ per cent. gold notes (\$1,000 each) dated Feb. 1, 1905. These are part of a present issue of \$4,000,000 of the authorized issue of \$4,500,000.

SCRANTON, FACTORYVILLE & TUNKHANNOCK.—This company, as recently reported in our Construction columns, has filed at Scranton, Pa., a mortgage with the Imperial Trust Co., of Jersey City, to provide for building its proposed line from Scranton to Tunkhannock, with a branch to Lake Winola, a total of about 30 miles of electric and steam lines, which, it is expected, will be completed in about a year. The authorized capital stock is \$1,500,000 in shares of \$50 each. The authorized issue of bonds is \$2,000,000 5 per cent. gold bonds of 1955, subject to call after February 1, 1910, at 105. J. Selden Swisher is President; C. W. Seely, Secretary and Treasurer, and James P. Dixon and Charles D. Sanderson, are interested, all of Scranton, Pa.

SOUTHERN CALIFORNIA (A., T. & S. F.).—This company has recently declared its first

semi-annual dividend of 3 per cent., since the lease to the Atchison made last July. The lease is at the rate of 6 per cent. until June 1, 1909, and thereafter at the same rate subject to discontinuation on six months' notice. The entire common stock of \$6,752,000, and a large majority of the \$6,012,000 preferred stock is owned by the Atchison.

SOUTHERN PACIFIC.—A statement has been made as follows by the Southern Pacific Company in reference to the Southern Pacific Railroad Company's new 4 per cent. first refunding mortgage gold bonds of 1905. All or any part of the issue is subject to redemption at 105 and interest on and after Jan. 1, 1910. Principal and interest are guaranteed by the Southern Pacific Company. These bonds are secured by a mortgage on all the railroads, franchises and property owned by the Southern Pacific Railroad in California, Arizona and New Mexico, subject only to the present mortgages, on which no further bonds will be issued and which will not be extended at maturity, and for the refunding and redemption of which a sufficient amount of new first refunding gold bonds are reserved. The first refunding mortgage will, therefore, eventually become a first lien on the entire railroad property now owned by the company. Of the \$93,682,500 prior lien bonds, \$44,517,000 mature or have been called for redemption on or before October 1. Of the remaining \$49,165,500, \$35,680,000 mature during the next seven years, leaving at the end of that time only \$13,485,500 unmatured. The total authorized amount of bonds is \$160,000,000, to be issued as follows: To refund or redeem a like amount of prior lien bonds, \$93,682,500; for use in refunding or redeeming prior lien bonds (balance for other purposes), \$15,000,000; on demand of the company, \$25,000,000; for construction, betterments, additions, etc., \$26,317,500. A block of the bonds is being offered for sale by Farson, Leach & Co., of New York.

SPRINGFIELD, SOUTH CHARLESTON, WASHINGTON COURT HOUSE & CHILLICOTHE TRACTION.—This property has been placed in the hands of Stacy B. Rankin as receiver. The line was put in operation in December from Springfield, Ohio, southeast to South Charleston, 12 miles, paralleling the Detroit Southern.

TENNESSEE CENTRAL.—Francis Brother & Co., of St. Louis, have recently offered for sale at 102½ and interest, a block of this company's \$3,354,000 collateral trust gold notes dated May 15, 1904, and due November 15, 1905, redeemable at maturity, as well as on 30 days' call, at 102½ and interest. The company owns and operates a railroad from Hopkinsville, Ky., through Nashville to Harriman, Tenn., 381.2 miles.

TEXAS & PACIFIC.—This company's report for the year 1904 shows gross earnings of \$12,433,147, compared with \$12,094,744 for 1903; expenses of \$8,111,692, compared with \$8,268,105 in 1903, leaving net earnings of \$4,321,455 in 1904 and \$3,808,639 in 1903. The surplus for 1904 is \$1,158,739, compared with \$938,723 in 1903, \$556,202 in 1902 and \$1,251,428 in 1901. This, for 1905, is equivalent to 2.98 per cent. earned on the \$38,763,810 capital stock. There is an increase in mileage of 99 miles in 1904.

VANDALIA (PENNSYLVANIA).—The stockholders of this railroad, on March 15, authorized an issue of \$25,000,000 of bonds, of which \$5,927,000 will be required to pay matured indebtedness, \$4,700,000 reserved for refunding purposes, and \$13,373,000 available for improvements.

WASHINGTON ROADS (ELECTRIC).—The shareholders of the Washington Water Power Co., of Spokane, Wash., have voted to increase the capital stock from \$2,500,000 to \$5,000,000. The company is now building an electric railroad from Spokane west to Medical Lake, 16 miles, and is erecting an 18,000-h.p. plant at Post Falls, Idaho.

